
DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Fort Leonard Wood, Missouri

Real Property Master Plan



July 2016

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DRAFT

**PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE REAL PROPERTY
MASTER PLAN UPDATE**

FORT LEONARD WOOD, MISSOURI

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DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Lead Agency: United States Department of the Army

Title to Proposed Action: Programmatic Environmental Assessment for the Real Property Master Plan Update at Fort Leonard Wood, Missouri

Affected Jurisdictions: Fort Leonard Wood, Missouri

Review and Comment: Written comments should be forwarded to: Martha Miller, Directorate of Public Works, Environmental Division, 8112 Nebraska Avenue, Building 11400, Room 202E, Fort Leonard Wood, MO 65473, and electronic comments should be submitted to: martha.m.miller.civ@mail.mil. The document is available online at: http://www.wood.army.mil/newweb/garrison/dpw_environmental.html and at the following libraries: FLW Bruce E. Clarke Library, 14020 MSCOE Loop, Fort Leonard Wood, MO 65473 and at the Pulaski County-Waynesville Library, 306 Historic 66 West, Waynesville, MO 65583. In addition, a public meeting will be held on July 18, 2016, from 11:00 a.m. to 1:00 p.m. at the St. Robert Municipal Building located at 194 Eastlawn Avenue, Suite H, St. Robert, MO, 65584.

Document Designation: Draft Programmatic Environmental Assessment

Abstract: The United States (U.S.) Army Installation Management Command and U.S. Army Garrison Fort Leonard Wood, Missouri (FLW or Installation), has prepared a programmatic environmental assessment (PEA) to evaluate the effects of the implementation of the Real Property Master Plan (RPMP) Update at FLW, which includes implementing the Installation Development Plan, Installation Design Guide, and Capital Investment Strategies. In addition to these long-term components, this PEA analyzes several construction projects necessary to meet Installation requirements in the short term. The PEA also evaluates a No Action Alternative, which is the continuance of the existing RPMP for FLW.

The PEA has been prepared pursuant to Section 102 (2)(c) of the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 4331 et seq.); the regulations issued by the President's Council on Environmental Quality for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] §1500–1508); and *Environmental Analysis of Army Actions* (32 CFR §651).

None of the predicted effects of the Proposed Actions would result in significant impacts to the quality of the human or biological environment at FLW, Missouri.

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EXECUTIVE SUMMARY

INTRODUCTION

United States (U.S.) Army Garrison Fort Leonard Wood (FLW or Installation) has prepared this programmatic environmental assessment (PEA) to examine the potential environmental effects of the implementation of the Real Property Master Plan (RPMP) Update, including the Installation Development Plan (IDP), Installation Design Guide (IDG), and Capital Investment Strategies, which consist of long-term strategies to guide the physical development of FLW over the next 20 to 30 years. In addition to these long-term components, this PEA analyzes several construction projects necessary to meet short-term Installation requirements. This PEA analyzes the overall programmatic environmental impacts of long-term components; environmental impacts of site-specific new construction through an assessment of existing best management practices (BMPs), standard operating procedures, and mitigation through the environmental review process; and cumulative effects of past, present, and foreseeable future actions.

This PEA was developed in accordance with the National Environmental Policy Act of 1969 (NEPA) [42 United States Code §4321 et seq.]; implementing regulations issued by the President's Council on Environmental Quality (CEQ), 40 Code of Federal Regulations (CFR) §§1500–1508; and 32 CFR §651, *Environmental Analysis of Army Actions*. The purpose of a PEA is to inform decision-makers and the public of the likely environmental consequences of the Proposed Actions and alternatives.

The purpose of the Proposed Actions is to implement the RPMP Update to provide a framework for future development that incorporates today's needs and mission requirements and allows Installation planners to sustainably accommodate future change. The need for the Proposed Actions is to fulfill objectives of the FLW Initial Integrated Strategic Sustainability Plan and to support the Installation mission and long-term strategic goals over the next 20 to 30 years.

BACKGROUND AND SETTING

FLW is primarily located in southern Pulaski County, Missouri, approximately 130 miles southwest of St. Louis, near the cities of Waynesville and St. Robert, Missouri. The Installation occupies about 63,000 acres of land, of which approximately 85 percent is used for range and training. A small portion of the training grounds is located in Laclede County, Missouri. FLW is home to the Maneuver Support Center of Excellence, which includes the U.S. Army Engineer School; U.S. Army Military Police School; and the Chemical, Biological, Radiological and Nuclear School. It is also home to a number of interservice, international, and interagency detachments as well as the Noncommissioned Officers Academy and One Station Unit Training for training activities.

PROPOSED ACTION

FLW is considering the implementation of the RPMP Update that comprises the IDP, IDG, and the Capital Investment Strategy. The purpose of the FLW IDP is to present a vision for future development that incorporates today's needs and mission requirements, while allowing Installation planners to sustainability accommodate future change. FLW's IDP consists of a series of framework and network plans that respond to site constraints, opportunities, functional relationships and planning efforts at the Installation scale. The IDG is a working document that establishes directions on standardizing and improving facility planning and design to guide the Installation as a visually coherent, functionally effective, and Soldier and Family friendly community in support of the Installation's mission readiness and quality of life. The Capital Investment Strategy includes the actions necessary to address identified facility deficits and excesses. The Proposed Actions also include several construction projects, within the Main Cantonment, necessary to meet short-term Installation requirements.

ALTERNATIVES

This PEA proposes a No Action Alternative and two Action Alternatives. Both of the Action Alternatives include all of the Proposed Actions. If needed, any number and combination of the actions could be incorporated into a final decision.

Alternative 1 – No Action

Under the No Action Alternative, the RPMP Update would not be implemented and management of FLW would continue based on the existing RPMP that is currently in effect. Implementation of projects to address existing facility deficits and excesses would occur on an informal basis. Inclusion of the No Action Alternative is prescribed by the CEQ regulations implementing NEPA and serves as a benchmark against which the environmental impacts of the Action Alternatives may be evaluated; therefore, the No Action Alternative is evaluated in the PEA.

Alternative 2 – Spine Roadway Option

Under Alternative 2, FLW would implement the RPMP Update and the features described under the Proposed Actions. In addition, to this update, Alternative 2 includes a major north-south transportation route, referred to as the Spine Roadway Option.

Alternative 3 – Loop Roadway Option (Preferred Alternative)

Under Alternative 3, FLW would implement the RPMP Update and the features described under the Proposed Actions. In addition, to this update, Alternative 3 includes a major north-south transportation route, referred to as the Loop Roadway Option. During the RPMP Update process, the Loop Roadway Option was identified as preferred, so Alternative 3 was selected as the Army's Preferred Alternative.

Alternative Considered but Eliminated From Further Consideration

An alternative that included the implementation of the actions described under the Proposed Actions as well as a north-south transportation route, referred to as the Hybrid Option, was considered but dismissed because the configuration of the transportation route would likely result in a number of substantial conflicts that would require significant traffic calming measures and/or road closures.

ENVIRONMENTAL CONSEQUENCES

Table ES-1 provides a summary of impacts by resource area for the No Action Alternative and the Proposed Actions.

Table ES-1. Summary of Environmental Consequences for Alternatives

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Air Quality	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Beneficial impacts from reduced emissions resulting from a transition to more efficient vehicles, potential reduction in vehicle trips, and additional vegetated and riparian areas. Less than significant impacts from short-term construction emissions and additional building facilities. Less than significant to potentially significant but mitigable impacts from power plant construction and operational emissions.	Potential beneficial impacts resulting from reduced congestion. Less than significant impacts from short-term construction emissions.	Potential beneficial impacts resulting from reduced congestion. Less than significant impacts from short-term construction emissions.
Biological Resources	No impacts.	Less than significant impacts to vegetation, wildlife, and sensitive species resulting from construction-related ground disturbance and noise, construction of future facility footprints, and potential operation of wind turbines.	Less than significant impacts to wildlife and sensitive species resulting from construction-related ground disturbance and noise.	Less than significant impacts to vegetation, wildlife, and sensitive species resulting from construction-related ground disturbance and noise
Cultural Resources	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Potential beneficial impacts resulting from less vehicle traffic. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.	Beneficial impacts resulting from vehicle reductions. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.	Beneficial impacts resulting from vehicle reductions. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Energy	No impacts.	Beneficial impacts to energy generation resulting from increased renewable energy generation and to energy security from greater energy generation on the Installation. Beneficial impacts resulting from vehicle reductions and energy efficient facilities. Less than significant impacts as a result of transit associated with oil seed cropland.	Potential, less than significant, indirect impacts as a result of increased travel.	Potential, less than significant, indirect impacts as a result of increased travel.
Facilities	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Beneficial impacts to facilities as a result of increased efficiencies, sustainability, connectivity, safety, and energy security. Beneficial impacts from addressing of facility deficits and excesses.	No impacts.	No impacts.
Geology and Soils	Less than significant impacts to soils from the informal construction of facilities at FLW inside the framework of the existing RPMP. No impacts to geologic features.	Beneficial impacts to soils and soil productivity resulting from the naturalization of the floodplain and the planting of native vegetation. Less than significant impacts to soils from ground disturbance. No impacts to geologic features.	Less than significant impacts to soils from ground disturbance. No impacts to geologic features.	Less than significant impacts to soils from ground disturbance. No impacts to geologic features.
Hazardous Waste, Hazardous Materials, and Safety	Beneficial impacts to human health and safety from the removal of asbestos and/or lead paint. Less than significant impacts from the potential for petroleum leaks from construction equipment.	Beneficial impacts to human health and safety through the identification, removal, and remediation of hazardous substances. Less than significant impacts from the potential of petroleum leaks from construction equipment.	Less than significant impacts to human health and safety from the potential for leaks of petroleum products related to the construction and operation of infrastructure.	Less than significant impacts to human health and safety from the potential for leaks of petroleum products related to the construction and operation of infrastructure.
Land Use	Less than significant impacts from continued operational deficiencies.	Beneficial impacts to land use from increased connectivity and land use compatibility.	Beneficial impacts to land use from increased connectivity.	Beneficial impacts to land use from increased connectivity.
Noise	Less than significant impacts from noise during informal construction of facilities.	Beneficial impacts from reductions in transportation-related noise sources. Less than significant impacts from noise during construction and potential, less than significant impacts from light rail and facility operations.	Less than significant impacts from noise during construction and operation.	Less than significant impacts from noise during construction and operation under each alternative.
Socioeconomics and Environmental Justice	Beneficial impacts to economic growth associated with the procurement of goods and services.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction and potentially operation.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction.

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Utilities and Services	No impacts.	Beneficial impacts resulting from installing new sewer lines and storm drains operating a power plant and renewable energy systems. Beneficial impacts from the construction and operation of high-efficiency facilities. Less than significant impacts to electrical utilities from additional requirements on existing systems as well as from construction requirements.	Less than significant impacts to electrical utilities and storm water systems from additional requirements on existing systems and construction requirements.	Less than significant impacts to electrical utilities and storm water associations from additional requirements on existing systems and construction requirements.
Water Resources	No Impacts.	Less than significant impacts to surface, groundwater, and riparian areas from construction and facility operation.	Less than significant impacts to surface, groundwater, and riparian areas from construction.	Less than significant impacts to surface, groundwater, and riparian areas from construction.
Transportation and Traffic	Less than significant impacts from the continuation of current congestion.	Beneficial impacts resulting from reduced congestion and increased connectivity, transit options, and walkability. Less than significant impacts from construction-related road closures and delays.	Beneficial impacts resulting from reduced congestion and pedestrian conflicts. Less than significant impacts from construction-related road closures and delays.	Beneficial impacts resulting from reduced pedestrian conflicts. Less than significant impacts from construction-related road closures and delays and from potential increases in traffic congestion.

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1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

The United States (U.S.) Army Installation Management Command (IMCOM) and U.S. Army Garrison Fort Leonard Wood (FLW or Installation) have prepared this draft programmatic environmental assessment (PEA) to examine the potential environmental effects of implementation of the Real Property Master Plan (RPMP) Update in accordance with the National Environmental Policy Act of 1969 (NEPA), the regulations of the President's Council on Environmental Quality (CEQ), the U.S. Department of the Army (Army) 32 Code of Federal Regulations (CFR) §651, *Environmental Analysis of Army Actions* (formerly Army Regulation 200-2). This PEA primarily focuses on the analysis of the RPMP Update, including the Installation Development Plan (IDP), Installation Design Guide (IDG), and the Capital Investment Strategies, which consist of long-term strategies to guide the physical development of FLW over the next 20 to 30 years. In addition to these long-term components, this PEA also provides a high-level analysis of several construction projects necessary to meet Installation requirements in the short term.

The PEA is a public document used to determine and evaluate the potential environmental consequences of proposed projects, identify mitigation measures to lessen or eliminate adverse effects, and examine feasible alternatives. The intended audience of the PEA is Army decision-makers, interested government agencies and non-government organizations, federally recognized Native American Tribes, and the public. The effects analyses in this report are based on a variety of sources and the best available information at the time of preparation. The information contained in this PEA will be reviewed and considered by the Army prior to the final decision on how to proceed with the implementation of the Proposed Actions, if at all, and to determine whether a Finding of No Significant Impact (FNSI) is appropriate or whether an environmental impact statement should be prepared.

1.2 Purpose of and Need for Proposed Action

The purpose of the Proposed Actions is to implement the RPMP Update to provide a framework for future development that incorporates today's needs and mission requirements and allows Installation planners to sustainably accommodate future change. The RPMP Update is a reference for design and programming of future project proposals. It supports the Installation mission and long-term strategic goals over the next 20 to 30 years.

The RPMP Update and the associated Proposed Actions are needed to fulfill objectives of the Initial Integrated Strategic Sustainability (ISSP) for FLW, published in August 2011, as well as to meet

numerous federal statutes, executive orders, and mandates regarding Installation energy consumption and sustainability. The first goal of the ISSP is for sustainable development over the next 20 to 30 years, which will transform FLW into “an installation with an efficient network of high-performance, sustainable, and resilient infrastructure systems, enabling mission assurance and mission expansion.” The RPMP Update was produced in accordance with Unified Facilities Criteria 2-100-01, *Installation Master Planning*, which provides guidance for RPMP development at installations. This guidance supports the Department of Defense (DoD) wide overarching installation planning philosophy to develop a sustainable platform to support the effective execution of assigned military missions as efficiently as possible.

Closely aligned with the ISSP’s objective “to incorporate FLW’s mission and vision with its energy, environmental, infrastructure, and resource planning into a long-term strategy,” the RPMP Update establishes following seven planning goals that help guide future development (see Figure 1-1):

- Create a campus setting
- Support flexible and sustainable development and the ISSP goals and objectives
- Develop a Family and Soldier friendly downtown
- Provide efficient transportation
- Create an amazing graduation ceremony experience
- Preserve lands for training
- Honor the history

In addition to the ISSP’s objectives, numerous federal statutes, executive orders, and mandates have formalized sustainability requirements through changes in our nation’s energy consumption and production and reduction in greenhouse gas (GHG) emissions (Table 1-1).



Figure 1-1. Fort Leonard Wood Real Property Master Plan Goals

Table 1-1. Summary of Legislation and Executive Orders Affecting Master Planning and Energy, Water Consumption, and Waste Generation

Federal Mandate	Resource Area	Performance Target
Energy Independence and Security Act of 2007	Total consumption from renewable sources	25% by FY 2025—"Sense of Congress"
	Fossil fuel use in new/renovated federal buildings	Reduce 100% by FY 2030
Executive Order 13514	GHG emission reduction	DoD goal: Reduce Scope 1 and 2 GHGs by 34% by FY 2020 DoD Goal: Reduce Scope 3 GHG emissions by 13.5% by FY 2020
	Net Zero buildings	All new buildings that enter design in FY 2020 and after achieve Net Zero energy by FY 2030
	Water consumption	Reduce consumption by 2% annually for 26% total by FY 2020 (FY 2007 baseline)
National Defense Authorization Act of 2007	Renewable fuels use	Directs the Secretary of Defense to consider renewable fuels in aviation, maritime, and ground transportation fleets.
	Facility renewable energy use	Produce or procure 25% of the total quantity of facility energy needs, including thermal energy, from renewable sources starting in FY 2025
National Defense Authorization Act of 2013	Master Planning	The commander of each military installation under the jurisdiction of the Secretary of Defense shall ensure that an installation Master Plan is developed to address environmental planning, sustainable design and development, sustainable range planning, real property master planning, and transportation planning. The transportation component of the Master Plan for a major military installation shall be developed and updated in consultation with the metropolitan planning organization designated for the metropolitan planning area in which the military installation is located.
Executive Order 13693	GHG emission reduction	Achieve 40% reduction in federal GHG emissions by 2040 compared to 2008 levels.
	Total consumption from renewable sources	Building's shall ensure that at a minimum the following percentage of total energy shall be accounted for by renewable sources: <ul style="list-style-type: none"> • not less than 10% in fiscal years 2016 and 2017 • not less than 13% in fiscal years 2018 and 2019 • not less than 16% in fiscal years 2020 and 2021 • not less than 20% in fiscal years 2022 and 2023 • not less than 25% by fiscal year 2025 and each year thereafter
	Energy use in federal buildings	Reduce 2.5% per year through FY 2025 (FY 2015 baseline)
	Fleet vehicle alternative fuel use	Meet a goal of 50% of all new passenger vehicles being plug-in hybrid or zero emission vehicles by December 31, 2015.

Federal Mandate	Resource Area	Performance Target
	Waste minimization	Divert from a landfill at least 50% of non-hazardous solid waste, annually, and pursue opportunities for net-zero waste and additional diversion opportunities. Divert from a landfill at least 50% of non-hazardous construction and demolition materials and debris.

Notes: DoD – Department of Defense, FY– fiscal year, GHG – greenhouse gas

1.3 Fort Leonard Wood Setting and History

FLW is primarily located in southern Pulaski County, Missouri, approximately 130 miles southwest of St. Louis, and 60 miles southeast of the state capital, Jefferson City. The Installation occupies about 63,000 acres of land, of which 53,995 acres are used for range and training (Figure 1-2). A small portion of the training grounds lie within Laclede County. The dominant landscape feature is the scenic Ozark Plateau, and the surrounding area is dotted with small- to medium-size towns among rolling forested hills, scenic water features, and agricultural land. The Houston-Rolla Ranger District of the Mark Twain National Forest borders the Installation on the east, south, and west. The towns of Waynesville and St. Robert border it on the north.

Interstate (I) 44 is 2 miles north of FLW and is the primary transportation arterial for the Installation, connecting it to St. Louis to the northeast and ultimate destinations in Oklahoma and Texas to the southwest. The length of road between Springfield, Missouri, and St. Louis is part of the historic Route 66. A spur from I-44 provides direct access to the Installation and to the town of St. Robert, directly adjacent to the northern boundary and the Main Gate. Several secondary gates provide access to FLW from the east, northwest, and south. A regional airport, known as Forney Army Airfield, is located at FLW. Both the military and civilians use this airport.

FLW's history began just before World War II when the government decided to establish suitable training areas for the expanding Army. In 1940, ground was broken for what was then known as the Seventh Corps Area Training Center. It was renamed as Fort Leonard Wood in early 1941 in honor of Major General Leonard Wood. Construction of the Installation was completed in June 1941, with nearly 1,600 buildings (greater than 5 million square feet [ft²] of floor space) built in 6 months at a cost of \$37 million.

During World War II, more than 300,000 Soldiers were trained at FLW. The initial mission as an infantry division training area was quickly expanded to include engineer training. FLW also served as a prisoner of war camp at that time. Many stonework features, stone culverts, and stone chimneys that were

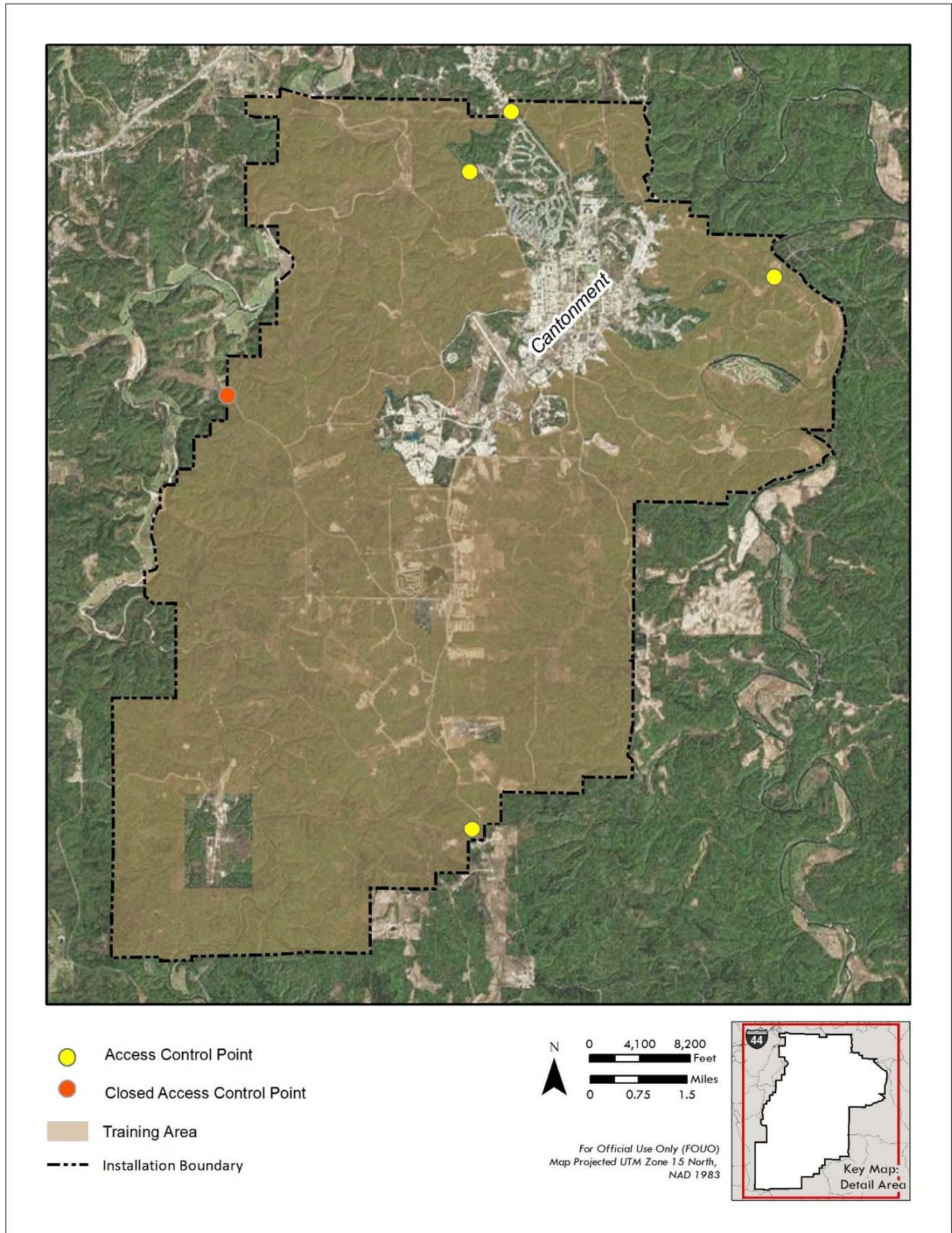


Figure 1-2. Fort Leonard Wood Location

constructed by POWs still remain. After the war, training at FLW declined and ceased completely in spring 1946. Much of the military reservation was leased to an Oklahoma rancher who used the area for grazing cattle.

FLW was reactivated in 1950 for the Korean War to provide basic and engineer training for Soldiers. Demands and aggressive efforts by local community leaders led to the establishment of FLW as a permanent Installation. In 1956, FLW was designated as the U.S. Army Training Center – Engineer.

Substantial funds were expended to replace the wooden World War II-era buildings with permanent brick structures, positioning the Installation to handle the significant increase in training workload brought by the war in Vietnam. In 1967, FLW provided 120,000 Soldiers with their basic, engineer, or skill training.

Following the Vietnam War, the overall number of Soldiers training at the Installation declined. The U.S. Air Force and U.S. Marine Corps began training their construction equipment operators at FLW. The Installation also started to provide engineer training to other nations. In 1988, the Installation picked up the mission for all Army motor transportation training.

The United States Army Engineer School began its move to FLW in 1985. When the move was completed in 1989, all engineer training, including officers, warrant officers, noncommissioned officers, and enlisted personnel, for the first time in nearly 50 years, would be conducted at the same location—a new \$60 million training and education facility. This expansion resulted in more construction, including a new commissary and fitness and training facilities.

In recent years, FLW provided units deployed to Southwest Asia and also processed more than 4,000 Reserve Component Soldiers, who were mobilized in response to the decision to invade Iraq. FLW also provided personnel and technical expertise to contingency and humanitarian operations in Somalia, Haiti, and Bosnia, as well as instruction in engineer construction techniques for the U.S. Navy, U.S. Air Force, and U.S. Marine Corps personnel.

Military Police and Chemical Schools were relocated to FLW as a result of the 1995 Base Realignment and Closure (BRAC) decision. A three-story general instruction facility was added to the existing Engineer School building to house the U.S. Army Military Police School and the renamed Chemical, Biological, Radiological and Nuclear School at FLW. This new facility included state-of-the-art technology, support facilities, and administrative offices for both schools, as well as an addition to the existing Engineer Museum and specialized training facilities. In 1999, the U.S. Army Military Police School and Chemical, Biological, Radiological and Nuclear School joined the Engineer School to form the Maneuver Support Center.

In response to the 11 September 2001 attacks on the U.S., FLW revised doctrine and tactics to meet an asymmetrical threat. The Installation also built and improved equipment to support forces from both the active Army and Reserve Component Soldiers.

At this time, FLW has a significant interservice, international, and interagency presence. Such groups include the largest Marine Detachment not located on a Marine Base, the largest U.S. Air Force detachment not on an Air Force Base, and trainees from all over the world. In October 2009, the FLW Maneuver Support Center was recognized as an integral part of the Army and was renamed the Maneuver Support Center of Excellence (MSCoE).

1.4 Project Background

1.4.1 Master Planning Process and Products

Master planning is an iterative process that involves meetings and other planning sessions (charrettes) as well as data collection to develop the preferred plan and feasible alternatives. The RPMP Update was initiated with a pre-kickoff meeting with team members. The FLW Directorate of Public Works served as the primary point of contact and coordinator for pre-kickoff meeting communications. The project kickoff meeting and initial planning workshops were held 23–27 January 2012. The kickoff meeting introduced the project to FLW stakeholders and tenants, and the subsequent workshops validated master planning goals and objectives.

After the kickoff meeting and initial planning workshops, the data collection phase began with three main events occurring:

- The project team collected and reviewed relevant existing planning documents and conducted an overall visual tour of the Installation.
- The project team met with 13 working groups, representing either the Installation or individual tenants throughout the planning process. These groups collectively brainstormed on a vision of the future FLW and provided independent input on asset opportunities and challenges. An Issues and Alternatives Report was prepared, which documented all planning-related issues raised by the working groups and potentials/opportunities identified for improvements.
- A planning summit representing collaboration among government agencies and the private sector was held in Washington, DC, on 20 and 21 March 2012. Aside from the project team, representatives from U.S. Army Corps of Engineers (USACE) and FLW ISSP team were present to discuss broad planning ideas and sustainable strategies that could be developed for FLW.

The RPMP Update consists of the following products described in more detail in Section 2.1:

- Installation Development Plan (IDP)—Area Development Plans, including detailed constraints and opportunities maps, regulating plans, illustrative plans, implementation plans, capacity analysis, and supporting sketches and renderings, as well as appropriate network plans
- Installation Design Guide (IDG)—Installation standards for development
- Capital Investment Strategy—overall Installation strategy for using and investing in real property, including a list of current known projects needed to support Installation missions

1.4.2 Area Development Planning Districts

The Installation is divided into identifiable and connected districts based on geographical features, land use patterns, building types, and/or transportation networks. An Area Development Plan should be prepared for each district. This leads to developing the RPMP in logical planning increments. By focusing master planning on districts, planners can identify areas that need planning attention due to mission, requirement, or command priority changes. The Main Cantonment at FLW is divided into 15 districts (Figure 1-3).

1.4.3 Constraints Mapping

Natural, cultural, and operational features impose limitations that impede development of land on the Installation. During development of the RPMP Update, constraining factors at FLW were categorized into “prohibitive” and “restrictive” constraints based on the levels of potential impact from development. Prohibitive constraints delineate areas where either existing features or regulatory factors would impose considerable hardship toward development, or where development can negatively impact the Installation’s mission fulfillment. Prohibitive constraints are to be avoided for future development. Restrictive constraints denote areas with constraining features that can be mitigated if impacted. Development within restrictive constraints is possible but requires proper measures to offset the impacts of the constraints. Figure 1-4 includes a composite constraints map for the Main Cantonment area at FLW. A summary of restrictive and prohibitive constraints is included in Table 1-2.

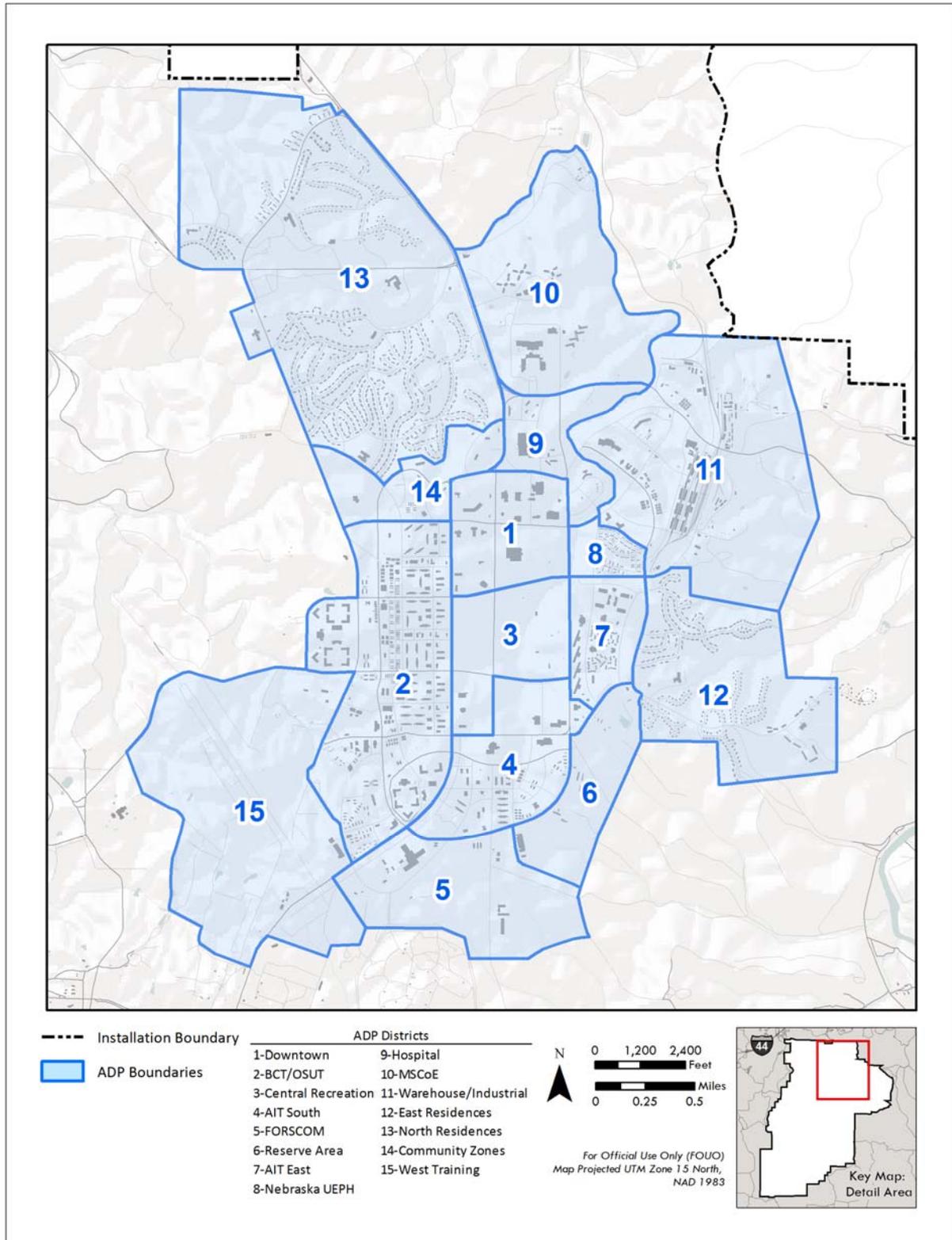


Figure 1-3. Fort Leonard Wood Area Development Planning Districts

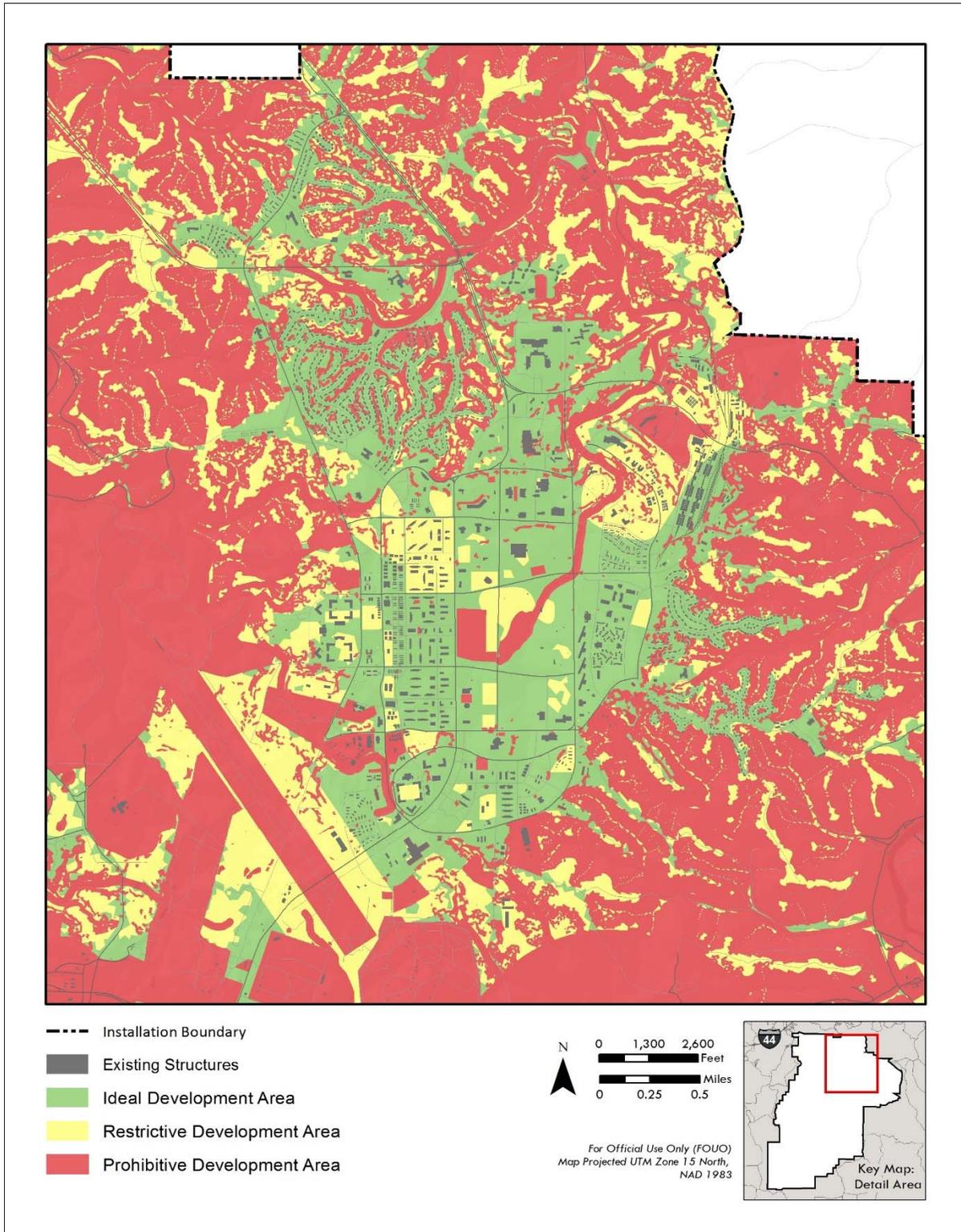


Figure 1-4. Main Cantonment Constraints Composite

Table 1-2. Fort Leonard Wood Development Constraints Matrix

Constraint Type	Restrictive	Prohibitive
Natural	Forest Lands Bat Management Zone 2 ^a	Steep slopes ^a Wetlands 100-foot riparian/natural resources buffer Riparian zone ^a 100-year flood zone Restricted zone Bat Management Zone 1 ^a
Cultural	Historic districts Historic structures	Cemeteries Parade field
Operational	Groundwater land use controls Underground storage tank Aboveground storage tank Ammunition supply Noise zones Airfield Accident Potential Zone 1 Airfield Accident Potential Zone II Physical training areas Unexploded ordnance contamination sites	Remaining land use controls Installation Restoration Program sites Explosive Safety Quantity Distance arc Airfield primary zone Airfield clear zone Range and training areas (excluding physical training)

^a Not located in the Main Cantonment area.

1.5 Decision to be Made

The Army will decide whether to execute the proposed RPMP Update and, if so, which alternative to pursue. Chapter 2 discusses the specific alternatives proposed for the RPMP Update. The final decision of which alternative to implement will be covered in the FNSI. It will identify the Army's preferred alternative and identify mitigation measures that are essential to reduce identified adverse impacts. In making the decision, the Army will select among the alternatives described in Chapter 2. This PEA analyzes the alternatives in as much detail as is currently available; however, additional project-specific NEPA may be necessary to ensure a full disclosure of environmental impacts and required mitigation measures.

1.6 Scope of Environmental Analysis

This PEA identifies, documents, and evaluates the potential environmental effects of implementation of the RPMP Update in accordance with NEPA implementing regulations issued by CEQ (40 CFR §§1500–1508) and the Army (32 CFR §651). The purpose of the PEA is to inform decision makers and the public of the potential environmental consequences of the Proposed Actions and alternatives along with associated mitigation. To understand the environmental consequences of the decision to be made, the PEA qualitatively and quantitatively evaluates the environmental impacts of the alternatives analyzed. Under NEPA, the analysis of environmental conditions only addresses those areas, or Region of Influence

(ROI), and environmental resources with the potential to be affected by the Proposed Actions or alternatives. Locations and resources with no potential to be affected are not analyzed. The ROI, which includes all areas and lands that might be affected, may vary by resource. The Army's NEPA regulation calls for the environmental analysis to be proportionate to the nature and scope of the action, the complexity and level of anticipated effects on important resources, and the capacity of Army decisions to influence those effects in a productive, meaningful way from the standpoint of environmental quality.

The scope of the environmental analysis included in this PEA is based on the scope of the Proposed Actions, which includes the implementation of the RPMP Update. The Main Cantonment is the primary focus of the components of the RPMP Update, and the environmental impact assessment is focused on actions within the Main Cantonment. The following assumptions also inform the scope of the RPMP Update and the environmental analysis included in this PEA:

- Specific plans for the range and training areas are being developed as part of the Range Complex Master Plan and are not included as part of the RPMP Update.
- Missouri National Guard leases approximately 65 acres and 49 buildings from FLW as training sites. A detailed plan for meeting Missouri National Guard requirements within its enclave is not within the scope of the Proposed Actions.
- FLW Family housing assets were transferred to private ownership in a 50-year lease. Therefore residential land use is not within the scope the Proposed Actions; however, it is within the scope of the environmental assessment to the degree that those areas are affected by the Proposed Actions.
- FLW Army Lodging became privatized in August 2011. Privatized Army Lodging land use is not within the scope of the Proposed Actions; however, it is within the scope of the environmental assessment to the degree that Privatized Army Lodging land use is affected by the Proposed Actions.

1.7 Related Plans and Environmental Documents

The following related plans and environmental documents are related to the scope of the Proposed Actions evaluated in this PEA:

2011 Fort Leonard Wood: Initial Integrated Strategic Sustainability Plan

This document represents the initial ISSP developed for FLW. It is a working plan containing six strategic sustainability goals that align with FLW's six core business areas. By integrating FLW's mission and vision with its energy, environmental, infrastructure, and resource planning, the ISSP ensures that FLW

can preserve its land, water, and air resources and continue meeting mission requirements in the future. The ISSP also includes related factors, such as action plans to guide and indicators to track FLW's progress in meeting its goals.

The ISSP process included significant effort developing the visions and goals in support of sustainability and the overall FLW mission. As such, the ISSP goals align with the RPMP Update goals; therefore, they were further developed and integrated into the Master Plan. Building on the efforts of ISSP, the strategies of the existing RPMP support the ISSP and will contribute to the realization of accelerated sustainable development at FLW.

U.S. Army Corps of Engineers 2030 Integration Project: Integrated Living Community (FLW)

The USACE's *Integration of Energy/Sustainable Practices into Standard Designs* focused on utility reduction improvements and design modifications for selected standard design types. The purpose was to "investigate building features and construction methods and materials to optimize the selected standard designs with regard to energy reduction and sustainability and at a minimum ensure that the selected standard designs meet all applicable energy reduction and sustainable design policy." The project team developed two Net Zero energy, water, waste area development plans for FLW's Brigade Combat Training (BCT) and Advanced Individual Training (AIT) areas. Recommendations for phasing through 2030 were also developed.

Net Zero Initiative

Executive Order 13514 in addition to ensuring the energy reduction requirements of Executive Order 13423, which includes a reduction in energy intensity by federal agencies of 30 percent by fiscal year (FY) 2015 compared to an FY 2003 baseline, remains in effect and directs 2 percent annual reduction in water consumption intensity from FY 2007 to FY 2020. Executive Order 13514 also requires that all new federal buildings must be designed to achieve "zero net energy" by FY 2030, starting in FY 2020.

In early 2011, the Army released a list of installations that are participating in an energy-conserving pilot program to only use as much energy as they create by 2020. The initiative, called Net Zero, focuses on energy as well as water and waste usage procedures. The Army's overall goal is to reach Net Zero status in all three areas, for all installations, by 2050. Although FLW was not on the list of the pilot program, the Installation further reviewed its current status on all three areas and identified strategies in order to achieve Net Zero requirements.

2010 Army Modernization Strategy

The 2010 Army Modernization Strategy defines how the Army continues to modernize and transform in order to fulfill its mission to sustain Soldiers and maintain readiness of the world's strongest and most capable Army. It describes efforts ensuring Soldiers have the best equipment and necessary capabilities to guarantee success for any mission or environment. The strategy describes the over-arching goals, priorities, and objectives to both internal and external audiences to ensure that the Army achieves unity of purpose in its modernization efforts. Mutual understanding and agreement on the basic elements of the 2010 Army Modernization Strategy is crucial to the Army's success.

U.S. Army Fort Leonard Wood Garrison Campaign Plan 2011–2017

This FLW Garrison Campaign Plan represents the FLW Garrison Commander's vision and plan for the Installation to bring effective and efficient services, programs and infrastructure to bear on the challenges faced by Commanders, military members, Families and civilians in a fluid operating environment. It lays out an overall strategy through six Lines of Effort (LOE) and Keys to Success, along with metrics to track progress. The Master Plan is integrated into LOE 4, Installation Readiness, of the FLW Garrison Campaign Plan. As such, the Master Plan will start the process to identify all facility needs and develop a program to modernize existing facilities that can meet mission requirement.

Maneuver Support Center of Excellence Campaign Plan Fiscal Years 2016–2018

This campaign plan serves as a 2-year plan for the MSCoE and integrates MSCoE's most important actions. It contains four LOEs, which represent the Commanding General's priority areas to reach the stated conditions assigned to each LOE and achieve the Commanding General's desired end-state. The FLW Garrison supports the MSCoE to develop agile, adaptive leaders of character (LOE 1, Objective 1.4) and to conduct functional training, enable total force integration, and enhance readiness for domestic incident response forces (LOE 2, Objective 2.2, Objective 2.4, and Objective 2.5, respectively) and leads the effort to achieve LOE 4 to maintain a resilient and sustainable workforce and Installation. In accordance, the Master Plan provides high performance development options as a road map for future growth in support of the Installation and MSCoE's missions and LOEs.

FLW Range Complex Master Plan

The FLW Range Complex Master Plan (RCMP) outlines the range, maneuver, and testing land requirements needed at FLW to support the Installation training and testing missions and notes how range facilities and training areas are to be managed in a manner similar to the RPMP Update for the Main Cantonment. It provides a view of the available training assets, identifies the users (customers), and establishes the training requirements based on Army training doctrine and resource guidance. This Master

Plan presents the overall development strategy for FLW. Therefore, it may incorporate relocations of training functions based on feedback from FLW. The RCMP will be taken into consideration to avoid mission conflicts and compromise of the Installation's training capacity. At the same time, the RCMP should not be construed in a way that interferes with the overall development for the entire Installation.

Feasibility of Energy Crops Grown on Army Lands (2011)

Oilseed crop is a renewable fuel source that can be used to produce biodiesel, a replacement for petroleum diesel. It presents an opportunity for the Army to move toward alternative fuel usage goals and maintain environmental stewardship. Cultivation of oilseed crops on suitable military lands could support appreciable levels of biodiesel production at reduced costs. This feasibility study investigated six Army installations, including FLW, and identified potentially suitable sites for energy crop production. Seven small acreage sites, total of 164 acres, at FLW are considered potentially suitable based on their locations in the river bottomlands known to have prime farmland soil types. It is estimated the expected yield at FLW is 85.7 gallon per acre, resulting in savings of \$0.83 per gallon. It is worth noting any land use for oilseed crops must be compatible in all respects with broader Army mission requirements. All live fire and impact areas are excluded from consideration as potential crop areas. Land proposed for oilseed crops needs to be individually analyzed.

Comprehensive Energy and Water Master Plan (2011)

This study evaluated the energy and water uses at the Installation and proposed action plans and future focus including short- and long-range improvements that would reduce energy and water consumption to meet federal mandates. Based on the study, up to 19.4 percent energy reduction can be achieved by upgrading aged, inefficient systems and equipment (compared to FY 2003 baseline). The Institution of the Energy Awareness Campaign can provide an additional 10 percent energy savings, and replacing or improving deficient structures will result in another 3 percent reduction. The study also looked at the overall renewable energy opportunities at FLW. At the time of this Master Plan, the return on investment analysis of renewable energy projects is challenging with the relatively low cost of electricity. The study also indicates that 13.5 percent water reduction required by Executive Order 13514 can be achieved by normal efficiency measures including minimizing leaks and other unaccounted-for water loss, reducing water consumed for irrigation, upgrading plumbing fixtures and improving the chiller plant.

1.8 Public Involvement

Public involvement is a critical and essential component of the NEPA process. The CEQ and Army NEPA regulations provide opportunity for the public to participate in this process. For this PEA, a public review period for the draft PEA began with the publication of a Notice of Availability (NOA) in local

newspapers. The decision maker will wait a minimum of 30 days from the date of the NOA publication before reaching a decision on this PEA.

1.8.1 Public Review and Comment Process

The NOA for the draft PEA was published in the Rolla Daily News, the Waynesville Daily Guide, the Houston Herald, the Guidon and the Lebanon Daily Record. The publication of the NOA initiates a 30-day comment period, during which the Army invites the general public, local governments, state agencies, and other federal agencies to submit comments or suggestions concerning the analyses and alternatives addressed in the draft PEA. Copies of the draft PEA are available for public review at libraries in the region including the FLW Bruce E. Clarke Library, 14020 MSCOE Loop, Fort Leonard Wood, MO 65473 and at the Pulaski County-Waynesville Library, 306 Historic 66 West, Waynesville, MO 65583 and on the FLW website at: http://www.wood.army.mil/newweb/garrison/dpw_environmental.html. FLW will hold a public meeting during the public comment period. Written comments should be forwarded to: Martha Miller, Directorate of Public Works, Environmental Division, 8112 Nebraska Avenue, Building 11400, Room 202E, Fort Leonard Wood, MO, 65473, and electronic comments should be submitted to: martha.m.miller.civ@mail.mil. In addition, a public meeting will be held on July 18, 2016, from 11:00 a.m. to 1:00 p.m. at the St. Robert Municipal Building located at 194 Eastlawn Avenue, Suite H, St. Robert, MO, 65584.

1.8.2 Final Steps in the NEPA Process

Following the close of the public comment period on the draft PEA, the following steps will occur in the NEPA process:

- **Prepare a final PEA**—Following the 30-day draft PEA public comment period, a final PEA will be prepared. This document will be a revision of the draft PEA that includes consideration of all public and agency comments and the Army's responses and provides the decision makers with a comprehensive review of the alternatives, their environmental impacts, and mitigation measures to minimize adverse impacts.
- **Decision Document**—If the results of the PEA indicate that the Proposed Actions would not result in significant adverse impacts, the decision maker will issue a FNSI, which would conclude the NEPA process. If the PEA were to determine that significant adverse impacts would occur, the decision maker will issue a Notice of Intent to prepare an environmental impact statement.

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2.0 DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

2.1 Proposed Actions

The purpose of the Proposed Actions is to implement the RPMP Update for FLW. The RPMP Update establishes long-term strategies to guide the physical development of FLW over the next 20 to 30 years. The RPMP Update comprises the IDP, IDG, and the Capital Investment Strategy. The Proposed Actions also include the implementation of several construction projects in the Main Cantonment necessary to meet Installation requirements in the short term. The following sections describe the features of the Proposed Actions for each of the RPMP Update components.

2.1.1 Installation Development Plan

The purpose of FLW's IDP is to present a vision for future development that incorporates today's needs and mission requirements, while allowing Installation planners to sustainably accommodate future change. The FLW IDP consists of a series of framework and network plans that respond to site constraints, opportunities, functional relationships, and planning efforts at an Installation scale. These plans help delineate focused growth areas within the Main Cantonment, create walkable districts, establish key transportation and land use concepts, and define other significant features that influence development patterns at FLW. The framework and network plans that compose the IDP include: the Roadway Network Plan, Transit Network Plan, the Pedestrian and Bicycle Networks Plan, the Green Infrastructure Framework Plan, the Utilities Framework Plan, and Area Development Plans.

2.1.1.1 Roadway Network Plan

Improving connectivity within the Installation is critical to the long-term success of the RPMP Update. While traffic control measures are in place throughout the Installation, circulation issues, such as conflicts between pedestrians and vehicular traffic, rush-hour congestion, and heavy training vehicles blocking roads, remain a challenge. To address these concerns, the Roadway Network Plan designates primary north-south routes through the Main Cantonment to smooth vehicular circulation and handle traffic with minimal pedestrian conflicts. Minimizing conflicts with pedestrians is especially important within and at the edges of the BCT and AIT areas, where trainees are more likely to walk.

Modern roundabouts would be considered at key intersections on the primary routes to ease traffic flow. Streetscape improvements would signal the street hierarchy and divert traffic from pedestrian-oriented streets. Future traffic studies would be required to analyze the locations and types of traffic calming best

suited for the Installation. Together, these measures would help reduce traffic congestion and conflicts. Section 2.2 provides further detail about the proposed Roadway Network Plan for each alternative.

2.1.1.2 Transit Network Plan

The Transit Network Plan seeks to relieve congestion, reduce energy consumption and pollution, and support flexible, sustainable campuses on FLW. The Transit Network Plan would include the construction and operation of a bus system for FLW to provide cantonment-wide transit service. Other future, long-term considerations would include light rail and a passenger link to existing rail off the Installation.

The basis of a bus transit system envisions an initial phase of two loops in the Main Cantonment (Figure 2-1). Each loop would connect to park-and-ride lots located at the North Gate and West Gate and possibly to other commuter lots off the Installation. The first loop would serve the highest density areas at FLW—the MSCoE (Area 10) and hospital (Area 9) sites. The second loop would connect the FORSCOM areas to provide access through the BCT (Area 2), AIT (Areas 4 and 7), and downtown (Area 1) districts of the Installation and then connect these areas to the training and motor pool areas by the airfield. All current diesel-fueled buses would be phased out, opting instead for hybrid electric, natural gas, or other sustainable transit systems for all high-occupancy traffic.

The potential feasibility of light rail as transit requires a more detailed cost benefit analysis. Any future light rail system would follow established, well-used bus lines. It is anticipated that feasibility would depend on an increasing trainee population, and increased density of transit destinations. As the RPMP Update is implemented and areas along Iowa Avenue and in the warehouse/industrial area (Area 11) are built out, a third “Garrison” loop may be added to connect these areas to the MSCoE (Area 10) and downtown (Area 1). If passenger rail is deemed feasible for the existing rail, this route would serve the Installation’s rail connection.

2.1.1.3 Pedestrian and Bicycle Networks Plan

A comprehensive network of pedestrian and bicycle infrastructure would reduce dependence on cars and promote the general health and welfare of the FLW community. Pedestrian and bicycle network infrastructure would be considered as part of every Area Development Plan and construction project. Figure 2-2 and Figure 2-3 illustrate the Installation-wide vision for a complete network. Implementation of the Pedestrian and Bicycle Networks Plan, however, relies on each project to build its own section of the overall plan.

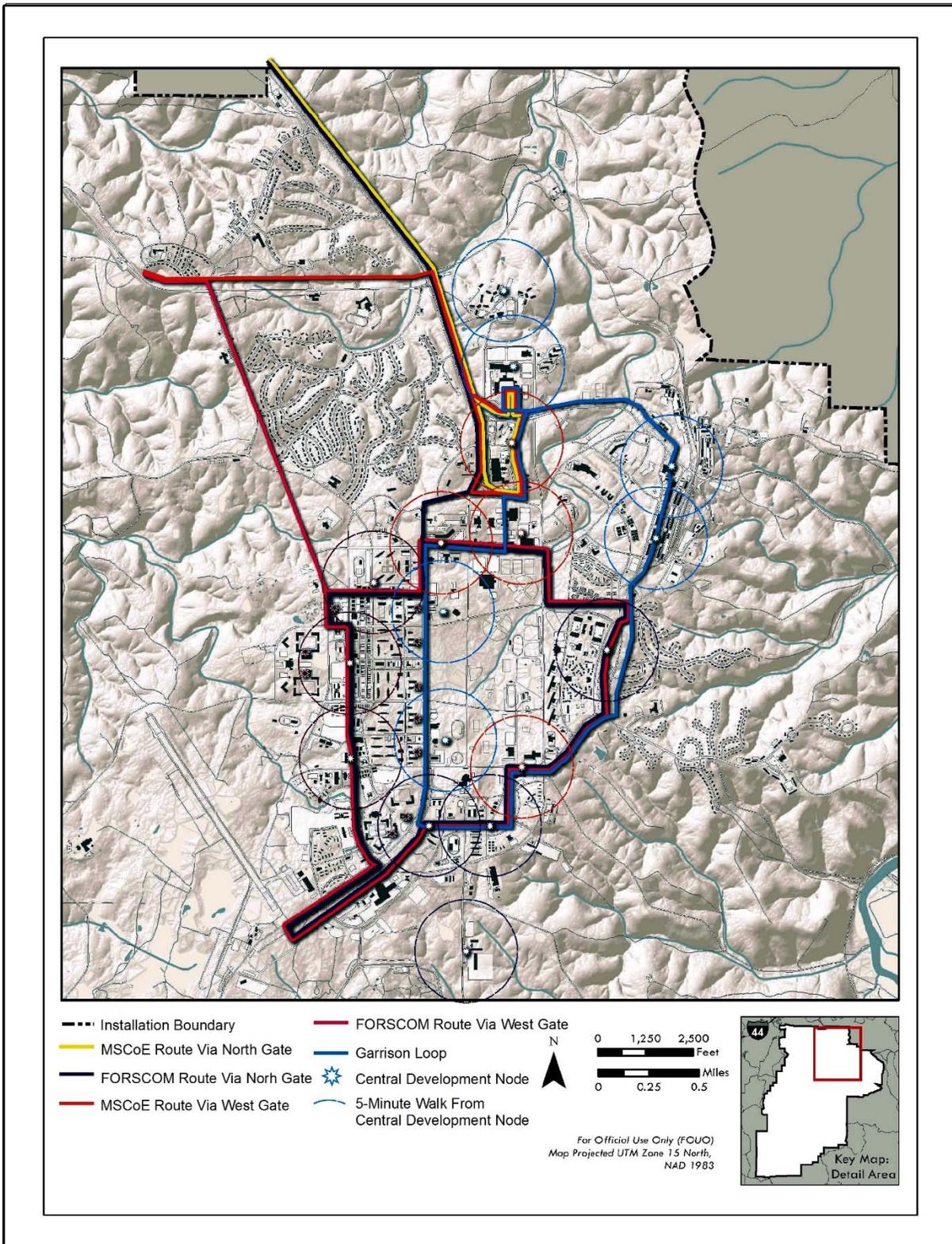


Figure 2-1. Transit Network Plan

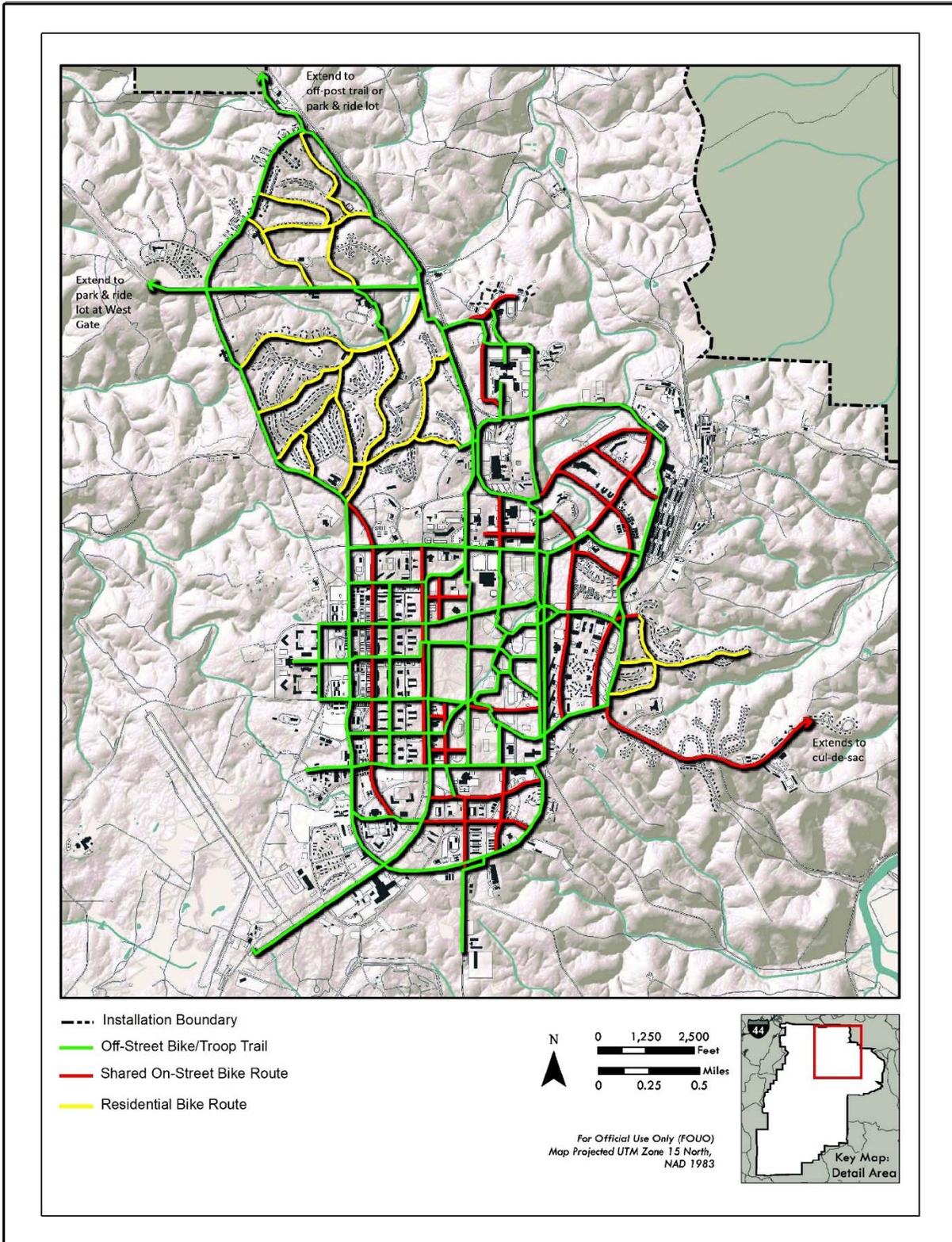


Figure 2-2. Bicycle and Trail Networks Plan

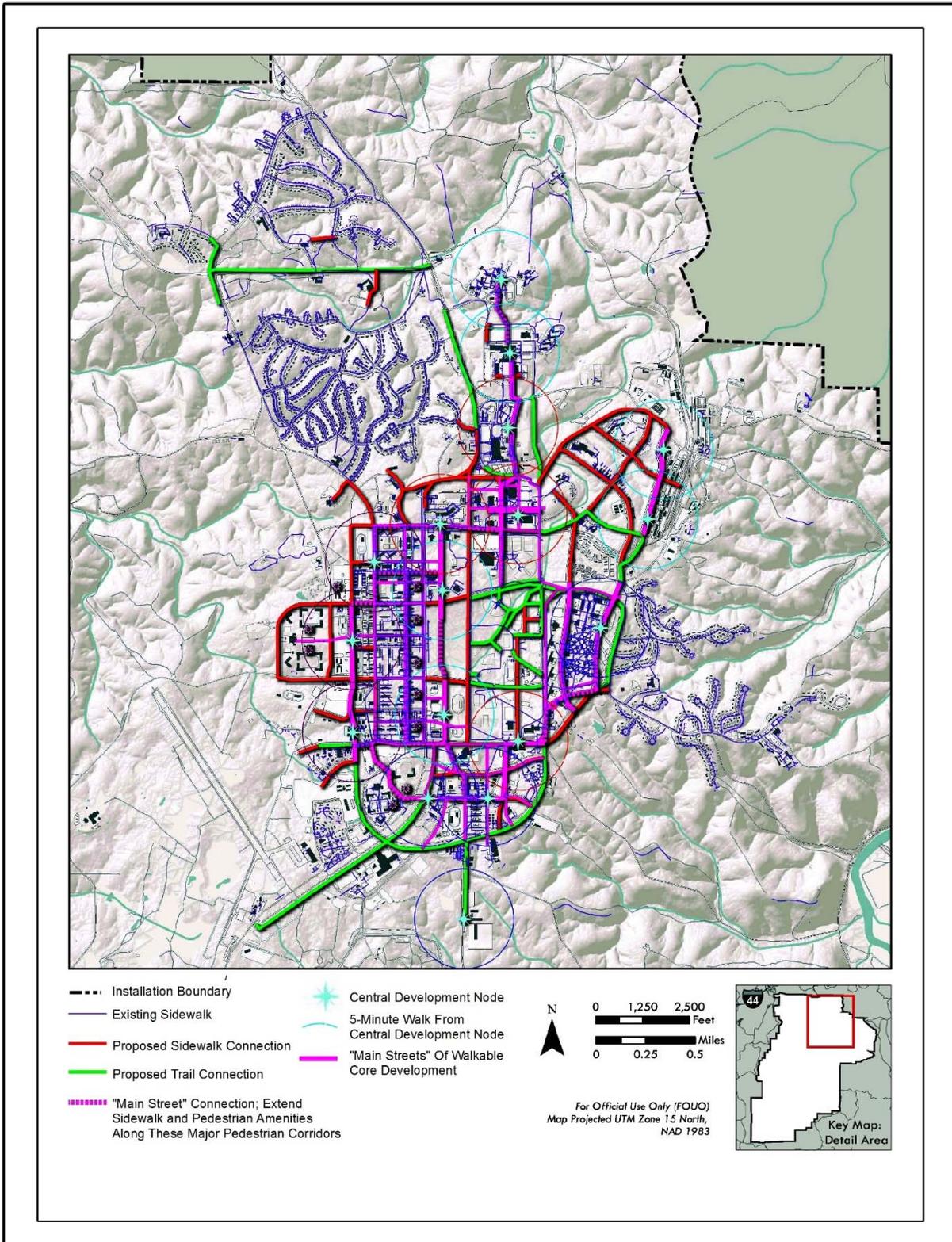


Figure 2-3. Pedestrian Network Plan

Bicycle infrastructure at FLW would be a combination of off-street trails and on-street lanes (separate or shared as pavement width allows). In general, off-street trails are recommended for areas of high speed traffic and areas with high volumes of trucks or military vehicles, including arterial streets defined in the roadway network. Off-street trails are also shown in BCT or park areas where existing trail sections would serve that purpose or where disconnected trail sections exist and need to be connected. Also, for streets with steep shoulders or other physical constraints, expanding an existing sidewalk may be more feasible than expanding or re-striping a roadway. Trails are expected to be multi-use bicycle and pedestrian trails.

Trails would be constructed with sufficient width and striped to accommodate two-way traffic. In trainee areas, trails may be used as troop trails for marching and formation. On-street bike lanes are recommended for areas where traffic is expected to be slower and the number of pedestrians higher. In these areas, bicycle infrastructure would be designed to minimize conflict with pedestrians, and biking on the sidewalk would be discouraged. Traffic lanes would be marked and bicycle signage added to these routes to promote the shared use of the roadway and to alert drivers to the presence of bicyclists. On residential routes, biking may occur on existing sidewalks for children or in the roadway for others. Signage may be added to alert drivers to the presence of bicyclists and to regulate the speed on residential streets.

The existing sidewalk network consists of islands of pedestrian connectivity separated by oceans of car-dominated streets. The Pedestrian Network Plan (Figure 2-3) would address this issue by promoting pedestrian connections throughout all areas of the Main Cantonment and between all development core zones. The first goal of the Pedestrian Network Plan is to fill the gaps between the “islands” of pedestrian connectivity by extending typical sidewalks or by constructing wider, multi-purpose trails. The latter would tend to occur where the routes coincide with the bicycle and trail plan, while the former are associated with on-street bike routes.

The Pedestrian Network Plan also identifies several “Main Streets” that would be the focus of the development cores. These Main Street would be the heart of the Installation’s walkable campuses, and the pedestrian experience is paramount along these routes. Sidewalks in these areas would be shaded or covered and include pedestrian amenities, such as regular seating areas, trash receptacles, wayfinding signage and landmarks, and pedestrian-scale lighting. Development along Main Streets would be oriented to the Main Street with a minimal setback, and front doors would be accessible from the pedestrian route. The Main Street connections (i.e., shown as dashed lines on Figure 2-3) would occur outside the development nodes and would provide a direct pedestrian route between the nodes. These routes would have a feeling of shade and enclosure and would continue to provide the pedestrian amenities of the main

streets; however, development would not be expected to be as dense or as strictly oriented to the pedestrian route. Wayfinding signage or landmarks would be an important design element for these routes.

Table 2-1 includes the estimated length and area of new proposed trail and sidewalk extensions based on the plan illustrated in Figure 2-3 and the IDG. These assumptions are used in the analysis of impacts included in Chapter 3.

Table 2-1. Length and Area Assumptions for New Sidewalks and Trails

Plan Feature	Length (feet)	Assumed Width (feet)	Area (acres)
New sidewalk	71,573	10	16.4
New trail	58,410	14	18.8

2.1.1.4 Green Infrastructure Framework Plan

The green infrastructure framework for FLW (Figure 2-4) provides the vision for an interconnected network of open space, “green streets,” and opportunities to integrate area-wide storm water infrastructure into future Area Development Plans. The Main Cantonment sits on a plateau, and natural drainage corridors extend in all directions. Previous development patterns and a system of concrete drainage channels have created storm water management concerns related to flooding, high flow velocities, and sediment load in runoff, and safety. The Green Infrastructure Plan identifies opportunities to address these issues and support FLW’s goal for Net Zero water by reserving from development a 100-foot riparian buffer for existing streams and identifying corridors to maintain as naturalized drainage ways. Existing concrete channels in these naturalized drainage ways would be removed, the drainage area widened to accommodate a natural floodplain, and native vegetation would be planted to improve filtration and infiltration of runoff. A general guideline is that 7 to 10 percent of a site would be reserved for storm water management. At FLW, the area for storm water management would be considered on an Area Development Planning (ADP) district level, not for each individual building. Figure 2-4 identifies preliminary areas for consideration for the planning of district-wide storm water management areas. Final planning would require individual geotechnical testing to determine the suitability of an area for storm water management and to rule out the possibility of creating sinkholes.

Green streets are also an essential part of FLW’s green infrastructure. These streets accommodate Low Impact Development into the streetscape and/or setback areas flanking them. Permeable pavement is an appropriate material for pedestrian areas. Green street concepts may be applied to any street at FLW and would not be limited to the priority green streets identified in Figure 2-4.

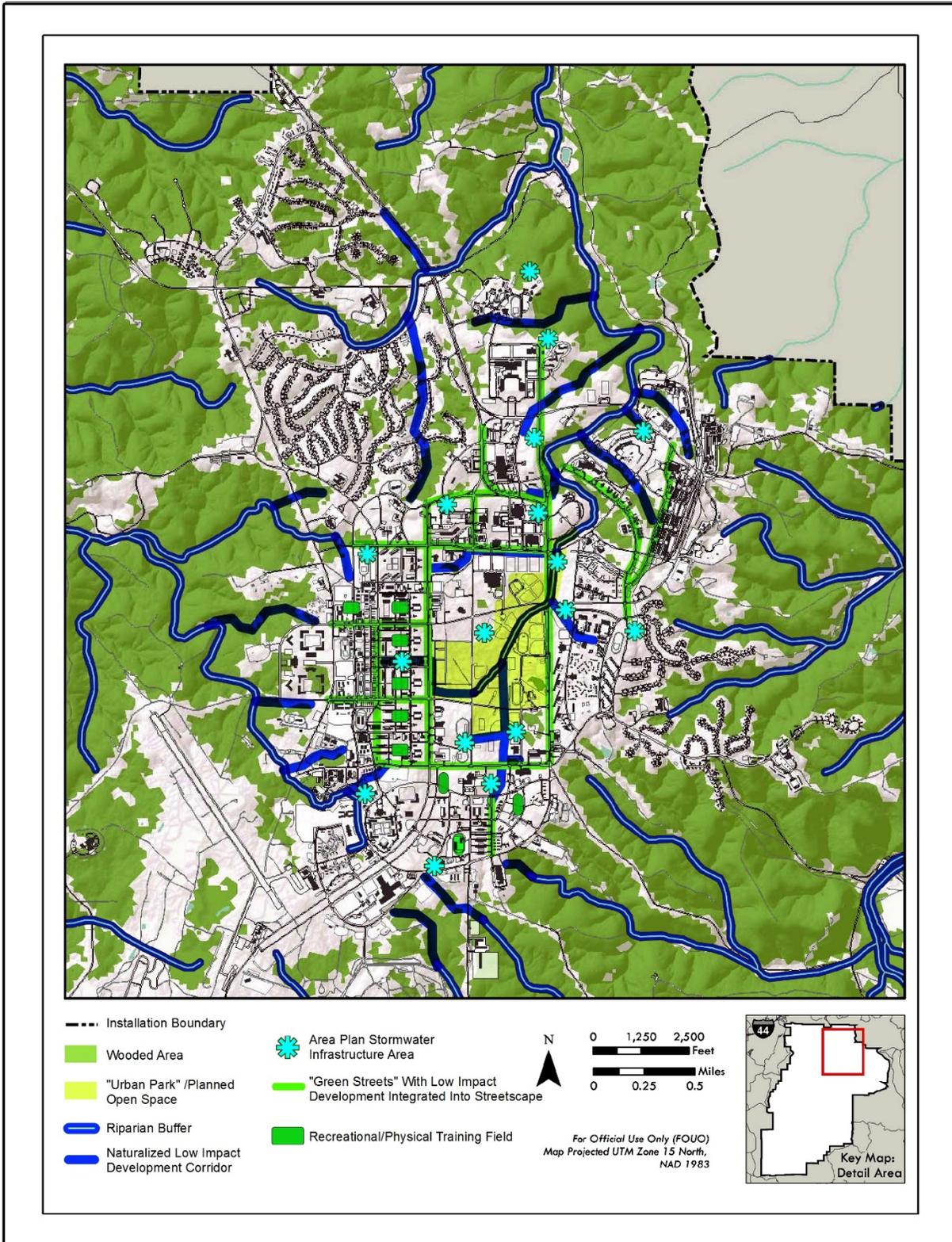


Figure 2-4. Green Infrastructure Framework Plan

2.1.1.5 Utilities Framework Plan

The utilities framework at FLW addresses the infrastructure needed to support mission requirements and Net Zero goals. Energy is a primary focus of the Utilities Framework Plan, which is divided into Installation-wide opportunities (Figure 2-5), district-level opportunities within the Main Cantonment (Figure 2-6), and strategies for individual facilities.

Biofuels Production

The Installation Energy Alternatives Plan (Figure 2-5) would reserve all river bottomland for the future production of biofuels. The study titled *Feasibility of Energy Crops Grown on Army Lands* (USACE 2011) noted that standard agronomic practices for oilseed crop production at FLW would be challenging; however, the study identified several small acreage sites totaling 164 acres of candidate sites that are potentially suitable for oilseed cropland on FLW. Oilseed cropland can be used to produce biofuel (B100). Potential candidate sites include:

- Eagles Nest Field (13 acres)
- Training Area 250 Downstream Field (16 acres)
- Angelica Field (7 acres)
- Happy Hollow (49 acres)
- Trout Stream Field (10 acres)
- One-lane Bridge FLW25 (30 acres)
- Training Area 224 former airfield adjacent to land mine training compound (39 acres)

In addition to the candidate sites, other areas that may be studied for oilseed production include road rights-of-way, effluent application fields, and other managed open spaces. Additional sites may require soil enrichment and other agronomic enhancements to be made feasible for crop production. Biofuel production would require truck and water access to croplands, storage and transport of oilseeds from the Installation to a processing plant, and transport of biofuels being shipped back to the Installation for storage. The current fuel storage area near the rail yard is a likely candidate location for expansion to handle biofuels. The production of biofuels would require the use of conventional farming methods and subsequently soil disturbance. This disturbance could result in water quality issues in the Roubidoux Creek and Big Piney Watersheds. To reduce potential water quality impacts, FLW could use vegetative buffers adjacent to fields in proximity to creeks and cover crops species in the non-growing season to protect soils.

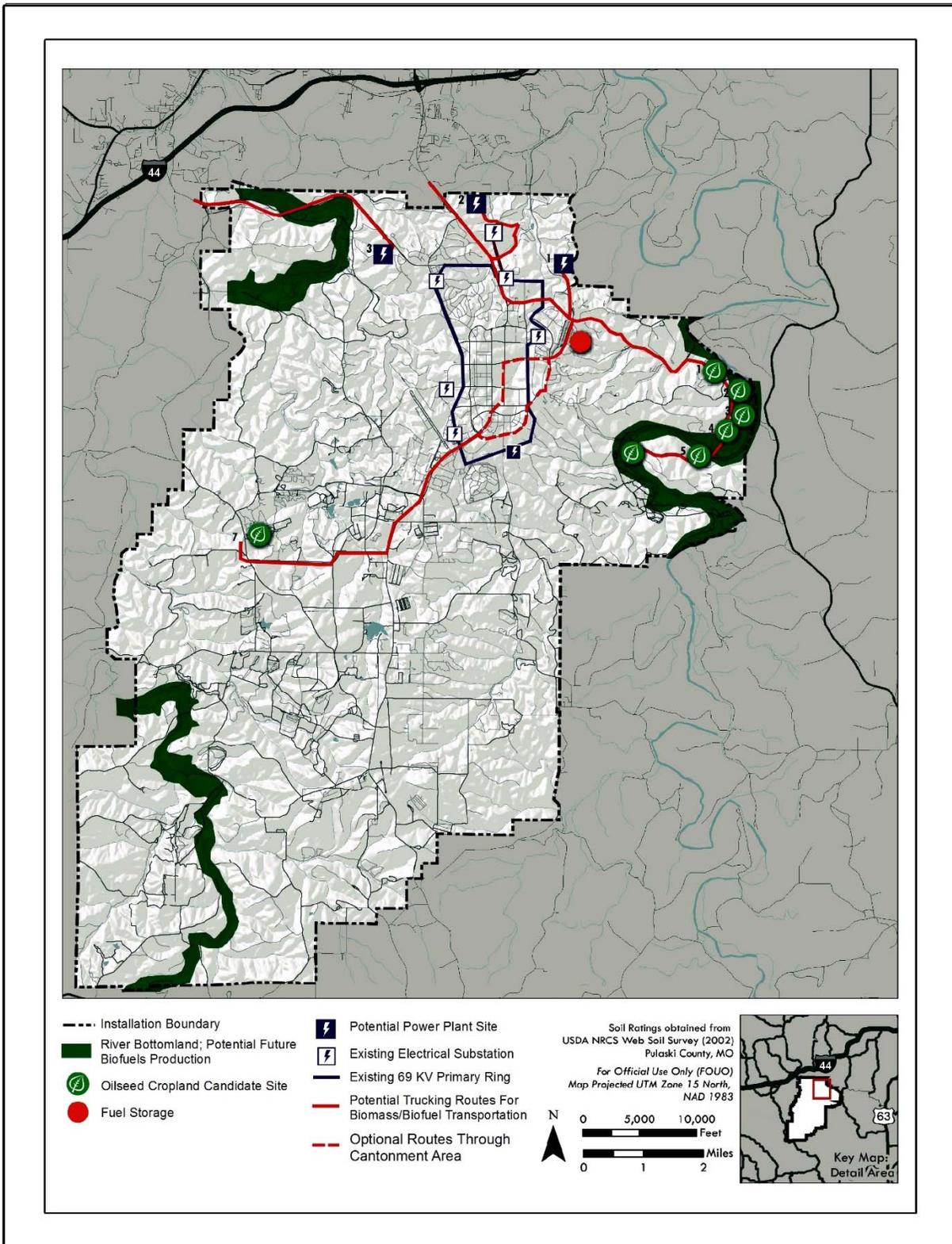


Figure 2-5. Installation Energy Alternatives

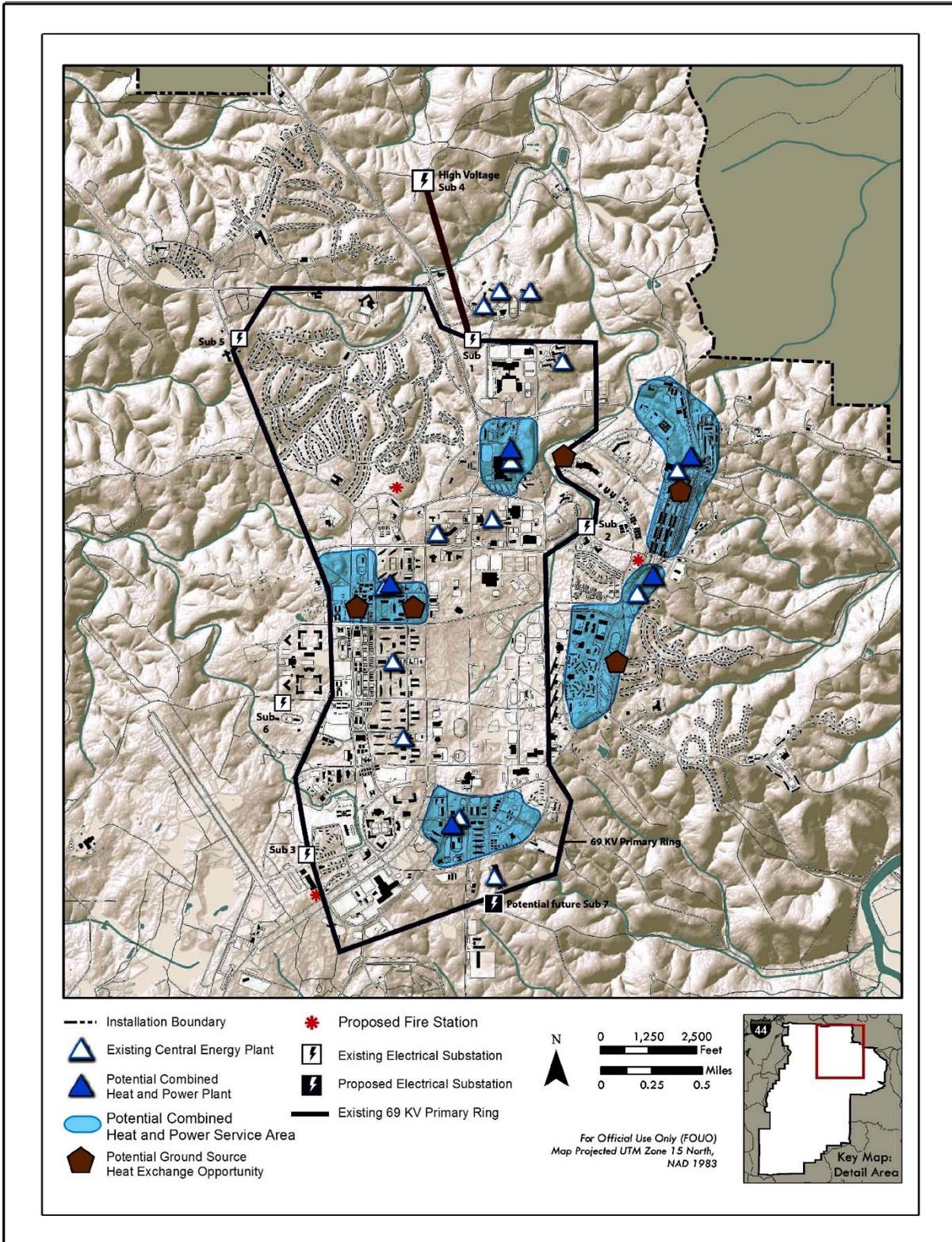


Figure 2-6. Main Cantonment Energy Alternatives

Power Generation

Power generation on the Installation would be considered as part of the strategy to meet the Installation's Net Zero energy goals. Three candidate sites were identified for the location of a potential power plant based on proximity to existing infrastructure:

1. North of the warehouses along the existing railroad line. This site allows the possibility to use the rail infrastructure for delivery of biomass that is generated at candidate sites on FLW as described previously or fuel to the plant and is relatively free of prohibitive environmental constraints.
2. Along Road A in proximity to the existing electrical substation and regional power distribution lines. Constraints in this area are generally related to steep slopes and limited flat area along the ridges.
3. Along Polla Road near the West Gate. This site allows the possibility of delivering biomass or fuel to the plant via truck with minimal effect on the traffic inside the Main Cantonment.

Further study would be required to determine the feasibility of locating power plants at these locations and would depend on the type and scale of the power plant.

Central Energy Framework

Future development would consider central energy systems to provide service to the walkable development cores. Central energy is an efficient method for providing heat and power to a defined district, and this would improve the overall energy independence and security for FLW. Five sites were identified for future combined heat and power (CHP) plants to serve areas targeted for significant redevelopment in the near future. Additional study may be needed periodically to examine the feasibility of new technology for providing central energy to these and other districts. The five potential areas for CHP plants include:

1. The warehouse/industrial area (Area 11) to the northeast of the Main Cantonment
2. Specker Village and future expansions to the AIT East (Area 7)
3. The AIT South (Area 4) located south of 19th Street
4. The north BCT area (Area 2), encompassing the proposed sites of BCT 2 and BCT 8
5. The area around the existing hospital (Area 9), including any redevelopment of the existing hospital

Ground Source Heat Exchange

Ground source heat exchange is an evolving technology that supplements the heating and cooling of a building or buildings by taking advantage of the constant temperature of the earth. The feasibility of using ground source heat exchange would be considered on an individual project basis and likely would not be a major district- or Installation-wide energy solution; however, several sites were identified for consideration of early adoption of the technology, including the BCT 2 and BCT 8 areas, AIT barracks expansion, warehouse/Director of Logistics (DOL) area, and the parcels south of 1st Street at Nebraska Avenue (currently slated for Noncommissioned Officer [NCO] Academy development). Further study of the feasibility of ground source heat exchange is needed for these and other areas.

Wind and Solar Energy

Wind- and solar-power generation would be considered on an individual project basis and likely would not be a viable district-wide, or Installation-wide, energy source. Evolving technology and the individual site and design characteristics of each project would require feasibility studies at the individual project level; however, the power grid at the Installation would be studied and improved to ensure that future integration of these technologies would be possible.

2.1.1.6 Area Development Planning Districts

The bulk of the Installation planning efforts should occur at the scale of an ADP district. This section summarizes the most recent results of master planning efforts for each ADP district; however, Area Development Plans have not been prepared or updated for all of the 15 ADP districts at FLW. This information will shape the programmatic impact analysis relative to potential development within each ADP district assessed in this PEA. Figure 1-3 shows each ADP district at FLW, and Table 2-2 summarizes the potential capacity build-out and demolition requirements within each ADP district, if known. Developable land as presented in Table 2-2 is the area within the ADP district that is not currently developed or in use (e.g., a building, parking lot, or recreation field) and does not fall within the area of a prohibitive constraint as described in Section 1.4. This developable land is used to provide context for the description of potential impacts in Chapter 3.

Area 1 – Downtown

A primary goal of the RPMP Update is to create a Family and Soldier friendly downtown (Area 1). In 2012, an Area Development Plan was developed for downtown, that would provide between 0.9 million and 1.6 million ft² of new construction capacity. Full build-out of this capacity would require demolition of approximately 340,000 ft² of the existing 700,000 ft² of buildings, including all buildings in the

northeast quadrant of downtown; however, the full build-out would still reflect a potential net increase of between 200,000 and 900,000 ft² over existing footage.

The 2013 FLW Downtown Area Development Plan establishes the vision for downtown as a destination that is accessible by multiple modes of transportation with pleasant, inviting, pedestrian accessible spaces and architecture. Downtown would be anchored by a graduation venue, which could also be used as an auditorium, classroom, or general assembly space. Other uses would focus on retail and community support with an option to also incorporate housing in the upper floors of downtown buildings.

Area 2 – Brigade Combat Team/One Station Unit Training

The future design of Area 2, Brigade Combat Team/One Station Unit Training (BCT/OSUT), would be based on the modular clusters of BCT barracks complexes. Each complex would include five open-bay barracks containing company operations and classroom space, covered training areas, a battalion (BN) headquarters (HQ) building with classrooms, and a running track. Area 2 has a total capacity of 11 BCT complexes. As of 2013, four BCT complexes are complete or under construction. The 2009 Area Design Guide includes plans for two additional complexes (II and VIII). Each BCT complex has a 1,200-person capacity, so at full build-out FLW would have a total basic training capacity of 13,200. It is assumed that the Rolling Pin Barracks Historic District would be replaced by a new BCT complex during future implementation of this plan.

Areas outside the potential BCT complexes would be reserved for training, vehicle storage, and other flexible, multi-use purposes that directly support the BCT/OSUT mission. Relocatable buildings and missions that do not directly support the BCT/OSUT would be demolished, and those areas reserved for close-in training or flexible use would be moved. Open space would be considered for potential as green infrastructure, including storm water management, ground source heat exchange, cropland for biofuels production, and other future potential uses.

Area 3 – Central Recreation

Area 3, Central Recreation, has limited potential for new or expanded building capacity. The value of the central recreation area lies in its mature groves of trees, recreational fields, trail access, and storm water management functions. Establishment of a linear park along Dry Creek would be a priority, and this project would include improvements to the riparian buffers, remediation of the concrete channels, and restoration of a natural stream condition.

Table 2-2. Proposed Capacity Development within the Area Development Planning Districts

Area Development Planning District	Developable Area ^a (acres)	Proposed Development	Proposed Demolition
Area 1 – Downtown	120	0.9 to 1.6 million ft ² construction	340,000 ft ² of buildings
Area 2 – BCT/OSUT	311	Area has a total capacity for seven additional BCT complexes; two are currently planned	Rolling Pin Barracks Historic District, and relocatable buildings and missions that do not directly support the BCT/OSUT
Area 3 – Central Recreation	107	300,000 to 600,00 ft ² of classroom and community support space, park establishment along Dry Creek, trail access improvement	Nutter Field House, Davis Club, and Abrams Theater
Area 4 – AIT South	192	Three AIT complexes; additional 165,000 to 250,000 ft ² of building capacity	Temporary and outdated facilities
Area 5 – FORSCOM Area	166	Tactical Equipment Maintenance Facility, COF, organizational storage, BN HQ facilities, wash rack	18,760 ft ² of semi-permanent classroom buildings
Area 6 – Reserve Area	46	Consolidate existing uses	None
Area 7 – AIT East	69	AIT Complex 2 (four barracks/COF buildings and one DFAC and BN HQ), relocation of one running track	35,116 ft ² of buildings
Area 8 – Nebraska UEPH	41	25,000 to 50,000 ft ² of building construction	None
Area 9 – Hospital	78	400,000 to 800,000 ft ² of construction	Old hospital; 95,000 ft ² of administration, UEPH, and instructional buildings
Area 10 – MSCoE	192	Near-term transit improvements, long-term infill surrounding MSCoE	None
Area 11 – Warehouse/Industrial	262	151,900 ft ² of joint administration/classroom; 378,000 ft ² warehouse/light industrial; 152,500 ft ² administration space; 7,250 ft ² multi-use space	400,000 ft ² of warehouse; 120,000 ft ² of administration space
Area 12 – East Residences	184	Relocation of Pershing Community Club functions, residential construction	Pershing Community Club
Area 13 – North Residences	602	650 units of townhome-style permanent-party barracks	None
Area 14 – Community Zone	105	Consolidation of existing buildings	None
Area 15 – West Training	325	Motor pool relocation	None

Notes: AIT – Advanced Individual Training, BCT – Brigade Combat Team, BN HQ - battalion headquarters, COF – Company Operations Facility, DFAC – Defense Finance and Accounting Center, ft² – square feet, FORSCOM – U.S. Army Forces Command, MSCoE – Maneuver Support Center of Excellence, OSUT – One Station Unit Training, UEPH – unaccompanied enlisted personnel housing

^a Area of ADP minus area of prohibitive constraints and existing development.

Trail access would be improved into and through the central recreation area (Area 3) to the core development areas more directly to one another and to the central recreation amenities. Proposed demolition of the Nutter Field House, Davis Club, and Abrams Theater would allow replacement with 300,000 ft² to 600,000 ft² of classroom and community support space, assuming two- to four-story development. The vision of the downtown (Area 1) as the primary graduation destination enables a re-imagining of this area. Its location between the BCT and AIT complexes, adjacent to the ceremonial parade field, and near conference and museum space along South Dakota Avenue make this area a prime candidate for a new core focused on a new mission or tenant.

Area 4 – Advanced Individual Training South

Area 4, AIT South, currently houses barracks, BN HQ, physical training, dining and classroom facilities for AIT functions. Five barracks are scheduled for short-term improvement through the Training Barracks Upgrade Program; however, many temporary relocatable structures are in use as barracks. The long-term vision for this area is to replace temporary and outdated facilities with new AIT barracks, Defense Finance and Accounting Centers (DFACs), and HQ facilities. This area has the capacity for three AIT complexes, similar to those recently constructed in Area 7, AIT East. Each complex would contain four 150-person barracks with an integrated Company Operations Facility (COF), BN HQ, DFAC, central energy plant and running track.

In addition to the three AIT complexes, an additional 165,000 to 250,000 ft² of building capacity (in two- to three-story buildings) would be constructed to house additional HQ, administration, classroom, or other functions that support the AIT mission. The complexes would be located within walking distance of the barracks. It is recommended that an Area Development Plan be developed for Area 4 to further clarify the mission uses and development capacity.

Area 5 – U.S. Army Forces Command Area

Development in Area 5, FORSCOM Area, would be consistent with the 2009 Area Design Guide, which adds to the existing 4th Maneuver Enhancement Brigade Complex facilities for the 94th Engineer BN, 5th Engineer BN, and Military Police Combat Support Company. Proposed complexes include the Tactical Equipment Maintenance Facility, COF, organizational storage, and BN HQ facilities, and a wash rack. The site plan would include the demolition of three semi-permanent classrooms—Buildings 2843, 2844 and 2845 (a total of 18,760 ft²). The site plan generally orients development to the relatively flat areas of the site to avoid steep slopes (greater than 20 percent). Further expansion beyond that planned in the 2009 Area Design Guide would include substantially greater cost and effort for clearing and grading.

Area 6 – Reserve Area

Area 6, Reserve Area, currently houses maintenance shops and storage facilities, some small general instruction buildings, and the water treatment facility for FLW. The steep topography restricts reasonable development beyond the existing limits of development and separates this area from adjacent parcels. Because of this area's location outside the Nebraska Avenue/Indiana Avenue loop road and its limited potential for walkable connections to other parcels, this area would not be a focus for the compact campus-style development that would characterize future development at FLW.

The focus of this area would be to consolidate the existing uses into the downtown (Area 1) or other compatible development cores. Potential compatible uses in this area are enclave-type uses, such as an expansion or relocation of the nearby Army Reserve Center, or as close-in training, storage, or maintenance related to nearby AIT functions.

Area 7 – Advanced Individual Training East

The 2009 Area Design Guide outlines AIT Complex 2 in two phases, including four barracks/COF buildings, one DFAC, and BN HQ. In Area 7, AIT East, the construction of phase 2 would require demolition of Buildings 1700, 1701, 1702, and 1711 (a total of 35,116 ft²). One running track would be relocated. Construction of AIT Complex 2 would provide barracks, HQ, and DFAC capacity for 1,200 Soldiers. Upon completion of AIT Complex 2, this area would be at capacity.

Area 8 – Nebraska Unaccompanied Enlisted Personnel Housing

As of 2012, the final phase of housing was being constructed, bringing the residential component of this area to capacity of 900 personnel. The northwest corner of Area 8, Nebraska unaccompanied enlisted personnel housing (UEPH), is reserved for a single Soldier-oriented entertainment and recreational facility, or other morale, welfare, and recreation use that would benefit from proximity to the permanent-party housing and downtown. A single-story, 25,000 ft² building is planned in the 2009 Area Design Guide; however, a two-story building or several smaller buildings oriented toward Replacement Avenue would also be appropriate, for a maximum capacity of 50,000 ft².

Area 9 – Hospital

The long-term plan to replace the hospital with a new facility in the adjacent open hilltop creates an opportunity to re-envision Area 8, Hospital, as an extension of downtown (Area 1) and a major connection between the downtown and the MSCoE (Area 10). If developed according to the same principles and design as downtown, this parcel could support 400,000 to 800,000 ft² of development with two- to four-story development fronting on a new central Main Street. This ultimate build-out assumes demolition of the old hospital and the 95,000 ft² of administration space, UEPH, and instructional

buildings (Buildings 312, 315, 318,319, and 320). Based on the age of the hospital, it is currently being evaluated for National Register of Historic Places (National Register) eligibility and if it is determined eligible, Section 106 consultation would be required prior to any demolition.

Area 10 – Maneuver Support Center of Excellence

As a general purpose instruction building and HQ, Area 10, MSCoE, is the destination of many unaccompanied personnel who travel to FLW for individual training. Many of these personnel may walk from nearby housing on the Installation; however, a significant amount of automobile traffic fills the adjacent parking areas. Future infill around the MSCoE may improve the internal walkability of the district, but without a concerted effort to provide a diverse mix of community-serving uses, the MSCoE would remain a commuting destination. The Master Plan would be best served by strengthening the MSCoE's link to transit and developing the link between the MSCoE and the downtown (Area 1). Near-term development of mixed, community-serving uses should be focused on downtown, before attempting significant infill around the MSCoE.

Area 11 – Warehouse/Industrial

The 2011 East Wood Area Development Plan outlines a vision for Area 11, Warehouse/Industrial, that would provide a net gain of 184,000 ft² of administrative use (to house a consolidated Directorate of Public Works (DPW) and other garrison support functions), 99,100 ft² of barracks, and a net loss of 22,000 ft² of warehouse. The Area Development Plan notes that the current warehouses are inefficiently configured, so new construction of warehouse would allow requirements to be reduced to more closely align with allowances. This net development would include demolition of 400,000 ft² of warehouse and 120,000 ft² of administration space. New construction would include 151,900 ft² of joint administration/classroom space, 378,000 ft² of warehouse and light industrial, 152,500 ft² of administration space, and 7,250 ft² of multi-use space.

Area 12 – East Residences

Area 12, East Residences, would see a short-term decrease in capacity as the 4100 block of transient officers' quarters and Pershing Community Club are demolished. The club, food, and entertainment functions of the Pershing Community Club would be relocated to Area 1, Downtown, or adjacent to the conference center expansion to the museum (Building 1607). Because of the neighboring residential uses that would persist, the area of the 4100 block would be best suited for eventual replacement by single-family residences.

Another option would be to vacate the 4700, 4800, and 4900 blocks of residences and convert the East Residences to close-in training for AIT use. A requirement for this option would be to relocate the

housing to the downtown (Area 1) or other development focus area for use as a vertical mixed-use compact campus.

Area 13 – North Residences

Development in Area 13, North Residences, would follow the 2009 Area Design Guide, which includes a project to construct 650 units of townhouse style, permanent-party barracks configured as 10-unit buildings.

Area 14 – Community Zone

The area between the North Residences (Area 13) and 4th Street is a rolling area of low density community buildings, known as Area 14, Community Zone. Roads in the Community Zone tend to be minor loop roads connecting two other major arteries or collectors without any central organizing element. This area provides a buffer between the Family housing to the north and the basic training area to the south and is planned to remain lightly developed. Future capacity would be expected to be similar to current development; however, future repair or replacement of existing facilities should seek to consolidate buildings into efficient facilities with a consistent setback and relationship to streets and parking, per the IDG.

Area 15 – West Training

The proposed extension of Artillery Circle and Indiana Avenue would potentially open new access to relatively flat parcels east of the airfield. Height restrictions and noise generated by the airfield are the major constraint for Area 15, West Training. Most of the area lies within the 65-decible (db) noise contour for the airfield. Motor pool relocation or expansion may be a compatible use that would benefit from proximity to the airfield and easy access to the training areas without having to pass through the Main Cantonment.

2.1.2 Installation Design Guide

The Proposed Actions would include implementation of the FLW IDG (i.e., the Installation planning standards). The IDG is a working document that establishes directions on standardizing and improving facility planning and design at FLW. It provides guidance for developing the Installation as a visually coherent, functionally effective, and Family and Soldier friendly community in support of the Installation's mission readiness and quality of life. The IDG would be used by all individuals involved in decision-making, design, renovation, construction, and maintenance of facilities. The overall goal is to improve the quality of the total environment of the Installation for those who live, visit or work there.

The IDG includes the following design standards:

- Proposed configurations and design requirements for all components of the circulation hierarchy including arterial, collector, and local roads, as well as off-street parking, pathways, and crosswalks and curb ramps.
- Architectural standards for future design and renovations; overall architectural design requirements including the following:
 - Adaptive reuse of existing buildings. Planned actions on existing historic buildings or historic districts that involve alterations to the buildings, landscapes, and World War II-era stonework would follow FLW Integrated Cultural Resources Management Plan (ICRMP) and would be carefully reviewed by the Installation’s Cultural Resource Division. Consultation and coordination with the State Historic Preservation Office for compliance with the historic preservation laws is also required.
 - Achieve, at a minimum, the required sustainability design rating for new construction and major renovations per latest applicable federal mandates and Army regulations.
 - Make efficient use of lands through multi-story development. Building design will aim for a “timeless design” and construction will employ sustainable materials and careful detailing that have proven longevity.
- Architecture standards pertaining to various aspects of building design, including:
 - Building placement and orientation
 - Building setbacks and build-to line
 - Building form and massing
 - Building heights
 - Building facades and fenestrations
 - Roof form
 - Materials and color
- Proposed design standards for natural landscape elements including trees, shrubs, ground cover and grasses, and human-made site elements including site furnishings, lighting, signage, and landscape-related force protection elements.

2.1.3 Capital Investment Strategy

The Capital Investment Strategy includes the actions necessary to address identified facility deficits and excesses. Table 2-3 summarizes the strategies proposed for applicable facility category codes (CATCODEs), where the strategy involves capital investment. It is assumed the construction and demolition for each CATCODE occurs within the developable area of one of the ADP districts.

Table 2-3. Capital Investment Strategy included in the Proposed Actions

CATCODE	Requirement	Construction	Demolition
14182—Brigade Headquarters Building	108,640 ft ²	41,530 ft ²	22,826 ft ²
14183—Battalion Headquarters Building	315,900 ft ²	76,000 ft ²	14,790 ft ²
14962—Centralized Wash Facility With Soaking Capability	2	2	1
17115—Band Training Building	20,330 ft ²	20,330 ft ²	13,280 ft ²
17120—General Instruction Building	836,836 ft ²	258,338 ft ²	13,280 ft ²
17135—Laboratory Instructional Building	45,732 ft ²	56,872 ft ²	18,760 ft ²
17136—Automation-Aided Instructional Building	361,585 ft ²	183,692 ft ²	0
17137—Material Handling Instructional Building	45,000 ft ²	45,000 ft ²	0
21410—Vehicle Maintenance Shop	454,425 ft ²	169,901 ft ²	31,741 ft ²
21470—Oil Storage Building, Non-DOL/DPW	24,840 ft ²	13,640 ft ²	0
43211—Cold Storage Building, Installation	41,712 ft ²	41,712 ft ²	0
44220—Storage Building, General Purpose, Installation	285,933 ft ²	251,502 ft ²	0
44224—Organizational Storage Building	243,511 ft ²	24,270 ft ²	0
44228—Hazardous Material Storage Building, Installation	21,455 ft ²	3,340 ft ²	0
61050—Administrative Building, General Purpose	500,113 ft ²	12,150 ft ²	0
72111—Enlisted Unaccompanied Personnel Housing	1,486 spaces	200 spaces	0
72121—Transient UEPH, Advanced Individual Trainees	4,761 spaces	150 spaces	0
72122—Transient UEPH, Advanced Skills Trainees	1,316 spaces	1,076 spaces	0
72181—Trainee Barracks	7,201 spaces	0 spaces	0
73019—Family Life Center	5,330 ft ²	5,330 ft ²	0
74022—Skill Development Center, Nonautomotive	25,000 ft ²	25,000 ft ²	0
74024—Automotive Skills Center	15,000 ft ²	15,000 ft ²	0
74025—Army Continuing Education System Facility	121,800 ft ²	121,800 ft ²	39,424 ft ²
74028—Physical Fitness Center	120,125 ft ²	9,000 ft ²	61,275 ft ²
74033—Army Community Services Center	24,125 ft ²	17,125 ft ²	14,800 ft ²
74065—Recreational Equipment Checkout	12,500 ft ²	3,103 ft ²	0
74066—Youth Center	58,160 ft ²	37,892 ft ²	0
74068—Recreation Center	55,600 ft ²	33,463 ft ²	0

Note: CATCODE – category code, DOL/DPW – Director of Logistics/Directorate of Public Works, ft² – square feet, UEPH – unaccompanied enlisted personnel housing

2.1.4 Short-term Projects

FLW has identified numerous projects that would be implemented in the short-term to meet Installation requirements. Several of these projects would contribute to meeting facility requirements identified in the Capital Investment Strategy summarized in Table 2-3. For impacts analyzed in this PEA, it is assumed that these projects would be located in the Main Cantonment and designed to be consistent with the IDP and IDG and as such impacts are identified by resource area in the Impacts Common to Both Action Alternatives subsections of Chapter 3. Table 2-4 summarizes these projects, and Appendix A presents descriptions of the projects.

Table 2-4. Short-term Construction Projects at Fort Leonard Wood

Army Project #	Facility	Construction Date	Cost Estimate (\$1,000s)	Assumed ADP Area
25927	General Instruction Complex	2019	16,500	11
58608	Instructional Building, Limited Use	2020	51,000	11
59546	Instructional Building, Limited Use	2019	78,000	2
61218	NCO Academy Complex	2019	54,000	9
65418	Centralized Wash Facility	2019	15,550	15
65680	Battalion Complex	2019	41,000	5
70362	Simulator Building (Motion-Based)	2019	26,000	11
75660	Fire Station	2019	10,400	11
75738	Storage Building, General Purpose	2019	32,000	9
77140	Blood Donor Center	2014	13,400	2
78184	Enlisted Unaccompanied Personnel Barracks	2019	27,000	13
78185	Enlisted Unaccompanied Personnel Barracks	2017	23,000	13
78609	Deployment Railhead Complex	2019	23,000	11
78610	Airfield Deployment Complex	2018	23,000	Airfield
78645	Automation-Aided Instructional Building Construction	2019	36,000	15
78646	Automation-Aided Instructional Building Renovation and Addition	2021	86,000	6
78848	Electric Power–Gas Fired	2018	90,000	9
80435	Administrative Building, General Purpose	2019	12,200	4
85201	Rescue Training Facility	2017	67,000	11
86713	Company Operations Facility	2021	4,800	9
86714	Fire Station	2021	3,900	15
88041	Training Support Center	2022	37,000	11
88319	Central Issue Facility	2022	18,500	9

Note: ADP – Area Development Planning, NCO – Noncommissioned Officer

2.2 Alternatives

This section describes the alternatives carried forward for analysis in this PEA. These alternatives include the No Action Alternative and two Action Alternatives. Both Action Alternatives include implementation of the following components of the Proposed Actions:

- Installation Development Plan to include:
 - Roadway Network Plan
 - Transit Network Plan
 - Pedestrian and Bicycle Networks Plan
 - Green Infrastructure Framework Plan
 - Utilities Framework Plan
 - Development within ADP districts
- Installation Design Guide
- Capital Investment Strategy
- Short-term projects to meet Installation requirements

The Action Alternatives differ by the proposed Roadway Network Plan. The specific details of the alternative Roadway Network Plans are described in Sections 2.2.2 and 2.2.3.

2.2.1 Alternative 1 – No Action

An environmental analysis of a No Action Alternative is required by the CEQ regulations to serve as a benchmark against which the Proposed Actions and alternatives can be evaluated. The No Action Alternative is defined as the environmental baseline conditions that would result if the RPMP Update were not to be implemented. Under the No Action Alternative, the RPMP Update would not be implemented and management of FLW would continue based on the existing Master Plan, currently in effect. The existing RPMP does not meet planning goals, as presented in Section 1.2. Under the No Action Alternative, implementation of projects to address facility deficits and excesses would occur on an informal basis without an established framework that enables suitable location of projects that address the large-scale functional relationships at FLW.

Under the No Action Alternative, the existing transportation network would remain in place. The current roadway framework at FLW contains more than 284 miles of roads with paved roads primarily existing within the Main Cantonment and generally unpaved roads in the range and training areas. In the Main Cantonment, existing transportation is provided by a network of roads primarily laid out in a grid pattern,

with all roads except Missouri Avenue, being paved, two-way and two-lane roads. Missouri Avenue is four lanes wide beginning north of its intersection with 1st Street. Traffic flow within the Main Cantonment is predominantly north/south along the primary roadways of Missouri Avenue, Iowa Avenue, and Nebraska Avenue. The Installation lacks a primary north-south route to accommodate major thru-traffic and reduce conflicts with pedestrians and local traffic. Major east/west primary roadways include 1st Street and North Dakota Avenue.

Per the IDP, two primary vehicular traffic flows were identified by Installation personnel:

- Traffic from the West Gate to the range lands. This route goes through the BCT/OSUT (Area 2) where trainees in outdoor physical training and troop marches often block or slow traffic on certain roadways in the morning.
- Southbound traffic from the Main Gate down Missouri Avenue to the down range. Daily peak-hour congestion usually dissipates beyond the hospital (Area 9); however, congestion along this route is especially an issue during weekly graduation ceremonies, when visitors park along both sides of Iowa Ave and visit nearby destinations.

The current roadway framework has led to circulation issues, such as pedestrian and vehicular conflicts, rush-hour congestion, and heavy training vehicles blocking roads.

2.2.2 Alternative 2 – Spine Roadway Option

Under Alternative 2, FLW would implement the RPMP Update and the features described in Section 2.1. In addition, to the RPMP Update, Alternative 2 includes a major north-south transportation route, referred to as the Spine Roadway Option, which concentrates traffic along Constitution Avenue, requiring a new connection between Constitution and Iowa Avenues (Figure 2-7). Alternative 2 provides the most direct route to the range area from the Main Gate, located at Missouri Avenue, moving the main traffic flow through the center of the Installation and bisecting downtown (Area 1).

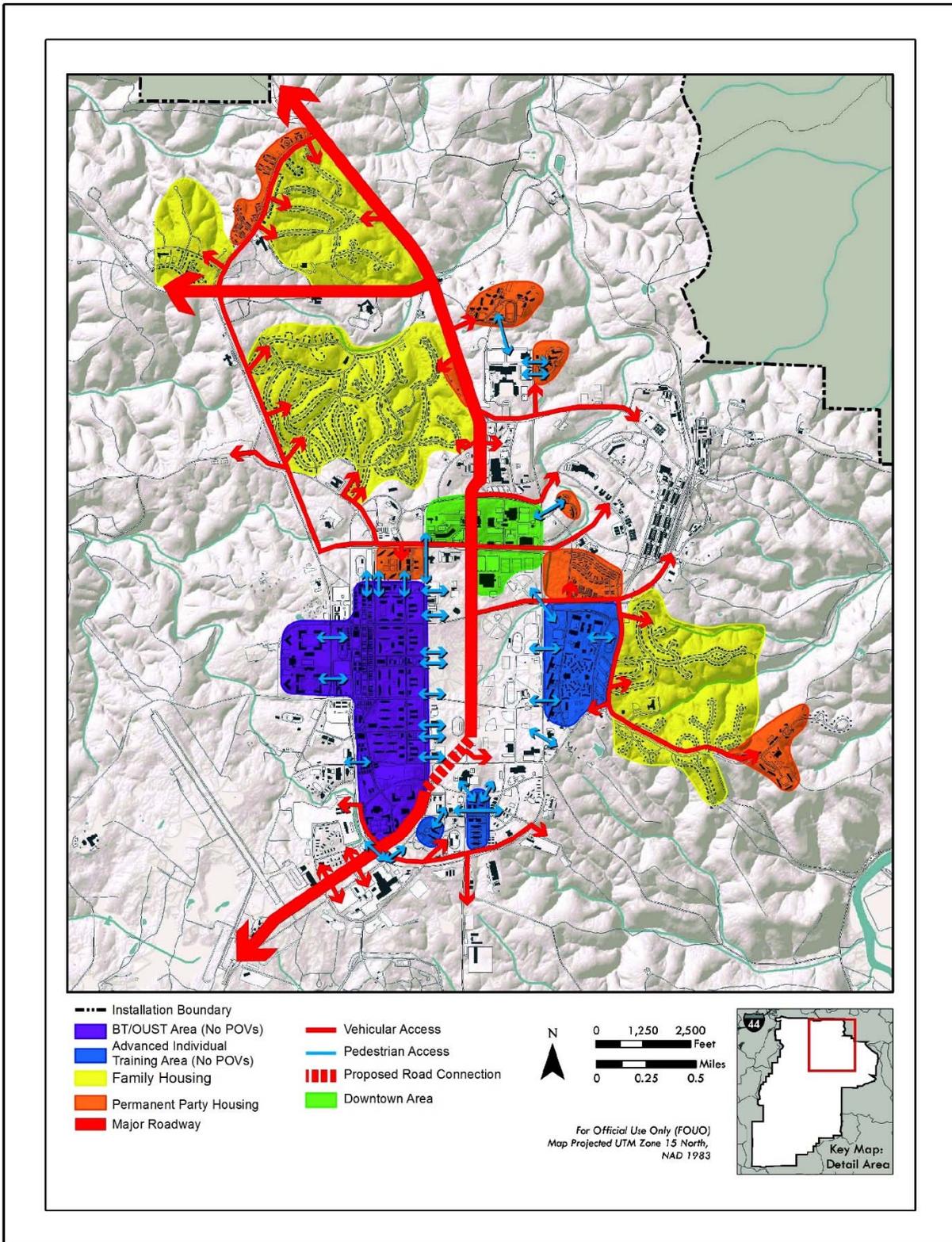


Figure 2-7. Alternative 2 – Spine Roadway Option

The Spine Roadway Option would require longer driving distances through the center of the Installation for traffic from the eastern residential and destination areas. Traffic would be drawn away from potential pedestrian conflicts at the BCT/BCT (Area 2) and AIT South and East (Areas 4 and 7); however, traffic from the West Gate would travel past existing schools.

The Spine Roadway Option would require approximately 1,800 feet of major roadway as shown in Figure 2-7. A road width of 32 feet would equate to 1.3 acres of surface area impact.

2.2.3 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Under Alternative 3, FLW would implement the RPMP Update and the features described in Section 2.1. In addition to these features, Alternative 3 includes a major north-south transportation route, referred to as the Loop Roadway Option, which concentrates traffic to Indiana and Nebraska Avenues skirting downtown (Area 1) (Figure 2-8). Alternative 3 allows for multi-modal access to the core of the Installation without bisecting it, preserving a pedestrian environment within the walkable center with few conflicts with pedestrians and having little congestion. During the Master Plan Update process the Loop Roadway Option was identified as preferred and as such Alternative 3 was selected as the Army's preferred Alternative.

The Loop Roadway Option would capture traffic from the eastern residential and destination areas prior to entering the central recreation area (Area 3) and would provide the most direct access to down-range from West Gate. The principal arterial loop generally follows Missouri Avenue, Nebraska Avenue, Alabama Avenue to Iowa Avenue, and continues north on Indiana Avenue. Minnesota Avenue is designated as a minor arterial and the main east-west vehicular corridor. The principal loop is proposed to extend south of the hairpin turn on Indiana Avenue and connect to Iowa Avenue. The Loop Roadway Option would provide direct access between the vehicle maintenance areas and the range complex, alleviating heavy vehicle traffic along Alabama Avenue. It would also provide access to areas east of the airfield that may be used for motor pool and close-in training expansion.

The intersection of Missouri Avenue and 1st Street would be realigned to improve flow of traffic from Missouri Avenue to Nebraska Avenue, and the use of Constitution Avenue would be deemphasized as a through-street to the southern portion of the Installation. Inside the loop, the network of collector and local streets creates an interconnected grid that would ease congestion by providing multiple connected route options.

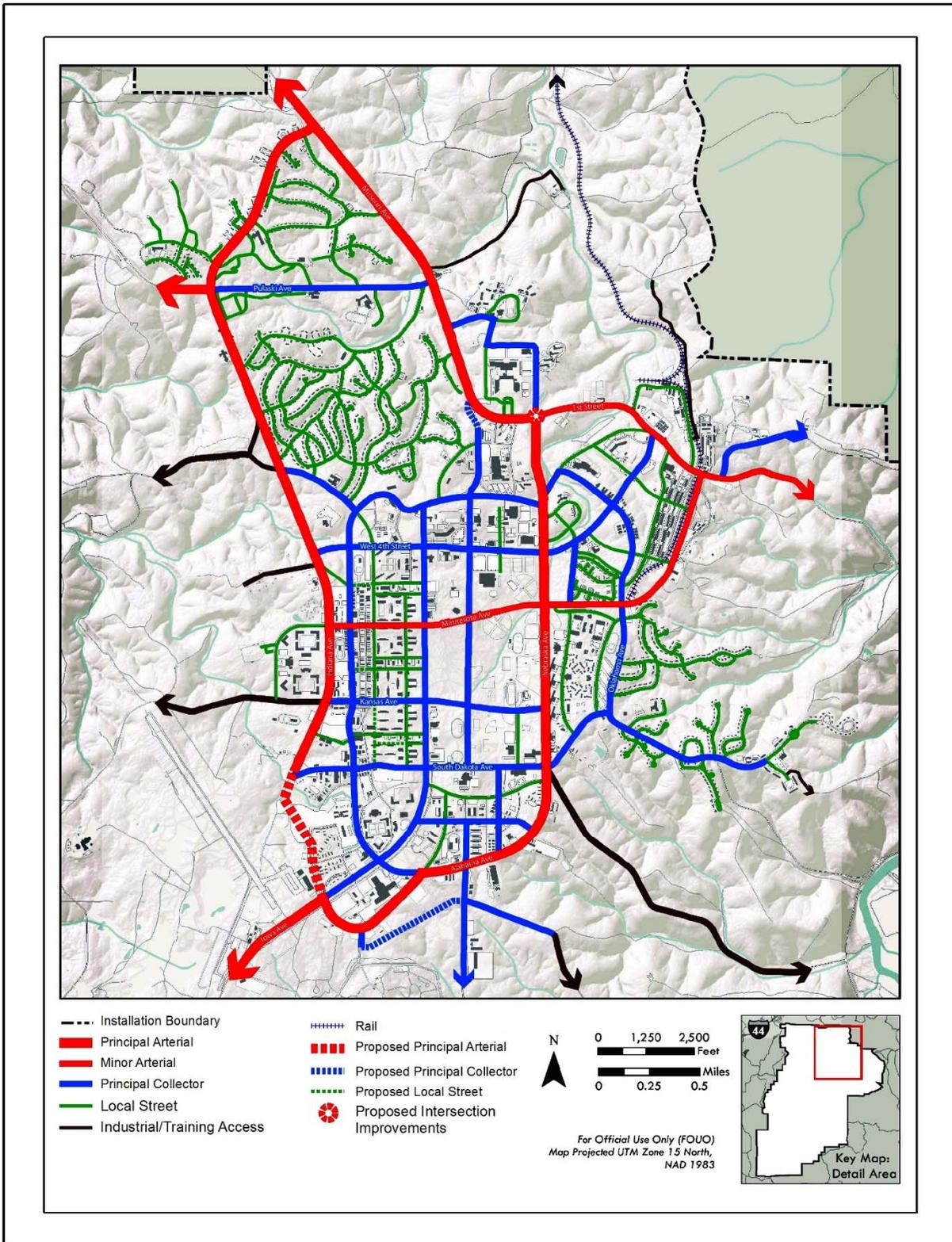


Figure 2-8. Alternative 3 – Loop Roadway Option

Alternative 3 would require 3,605 feet of new principal arterial, 3,852 feet of new principal collector, and 3,521 feet of new local streets. Table 2-5 summarizes the roadway width and area assumptions used for impacts analysis in Chapter 3.

Table 2-5. New Roadway Length and Width Assumptions for Alternative 3

Plan Feature	Length (feet)	Assumed Width (feet)	Area (acres)
New principal arterial	3,590	32	2.6
New principal collector	3,802	20	1.7
New local street	3,565	15	1.2
Total	10,109	-	5.5

2.3 Alternatives Considered but Eliminated from Further Consideration

The following alternatives were considered during alternatives development but were eliminated from further consideration for reasons described in each section.

2.3.1 Hybrid Option

An alternative with a major north-south transportation route, referred to as the Hybrid Option, was considered but dismissed from further evaluation. The Hybrid Option incorporated portions of the Spine Roadway Option and Loop Roadway Option by providing a transportation network to downtown (Area 1) without bisecting it, while still providing a transit loop around the Main Cantonment. The Hybrid Option assumed future use of the 600 blocks and adjacent land for BCT/OSUT and, as such, did not bisect the Main Cantonment. Under the Hybrid Option, Nebraska Avenue would have been recognized as the major collector for the east portion of FLW. Implementation of the Hybrid Option would have required new construction between Constitution and Iowa Avenues. While the Hybrid Option would have provided quick access to the downtown (Area 1) without bisecting it, this option was dismissed because downtown would require significant traffic calming or road closure to prevent vehicle shortcut on Constitution Avenue. Additionally, the route from the West Gate to down range is exceedingly circuitous.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter describes the affected environment of FLW. The affected environment consists of baseline conditions that are used for analysis of the environmental effects from the alternatives described in Chapter 2. An ROI is described for each resource area. The ROI varies among resources and defines the geographic extent of potential effects from the alternatives on the important elements of that resource. Each section in this chapter delineates its ROI and identifies the topics and resources addressed by that section. Immediately following the affected environment discussion for each resource is the presentation of environmental consequences or effects of each alternative.

The CEQ defines direct effects as those caused by an action and occur at the same time and place, whereas indirect effects are caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR §1508.8). For example, impacts from construction of facilities at FLW would be a direct effect associated with the alternatives, while spending on supplies for the project by a construction services vendor would be an indirect effect. Impacts are characterized in this PEA as:

- Beneficial—A positive net impact.
- No impact—No measurable impacts expected to occur.
- Less than significant (minor to moderate)—Impact that is not significant but is perceptible and readily apparent. Additional care in following standard procedures or applying precautionary measures to minimize adverse impacts may be required.
- Significant but mitigable—Significant impact anticipated, but the Army can set management actions or other mitigation measures in place to reduce impacts to less than significant.
- Significant—An adverse environmental impact, which given the context and intensity, violates or exceeds regulatory or policy standards or otherwise exceeds the identified threshold. The significant impact, however, cannot be mitigated with practical means to a level below significance.

Significance thresholds for each resource are included in Table 3-1. The CEQ guidelines indicate that the significance of an impact is determined by the intensity and the context of the impact. Intensity refers to the severity or extent of an impact, and context relates to the environmental circumstances at the location of the impact. Significance criteria were developed in consideration of CEQ's guidance for determining significance (40 CFR §1508.27).

Table 3-1. Significance Thresholds for Each Resource Topic

Resource Topics	Significance Threshold
Air Quality	Impacts would be considered significant if emissions would: <ul style="list-style-type: none"> • Increase ambient air pollution concentrations to exceed the NAAQS. • Impair visibility within federally mandated Prevention of Significant Deterioration Class I areas. • Result in the potential for any stationary source to be considered a major source of emissions as defined in 40 CFR §52.21 (total emissions of any pollutant subject to regulation under the CAA that is greater than 250 tons per year for attainment areas) or • For mobile source emissions, result in an increase in emissions to exceed 250 tons per year for any pollutant.
Biological Resources	Impacts would be considered significant if they were to result in: <ul style="list-style-type: none"> • Substantial permanent conversion or net loss of habitat at landscape scale. • Long-term loss or impairment of a substantial portion of local habitat (species dependent) or substantial loss to a species population resultant from implementation of the Proposed Actions. • Unpermitted “take” of threatened and endangered species or other legally protected species (e.g., migratory birds).
Cultural Resources	Impacts would be considered significant if they meet one or more of the following criteria: <ul style="list-style-type: none"> • The activity would cause an adverse effect on an archaeological, historical, or other cultural site that is listed in or eligible for inclusion in the National Register of Historic Places, and measures minimizing or mitigating the adverse effect of the resource are not implemented. • The activity involves construction, repair, or maintenance affecting contributing elements to a historic building or district. • The activity would permanently introduce visual, audible, or atmospheric elements that are out of character with the historic property or alter its setting when setting contributes to the property’s qualifications for the National Register of Historic Places. • The activity would restrict access to a cultural resource of significance to the federally recognized Native American Tribes, and no attempt has been made to address issues through government-to-government consultation.
Energy	Impacts would be considered significant if: <ul style="list-style-type: none"> • The immediate and/or long-term energy demand of FLW would have the potential to exceed the actual or projected capacity of FLW or its energy suppliers to provide service and would not produce enough energy to meet the energy demands to support the FLW mission. • Or the Proposed Actions would interfere with FLW’s ability to absorb intermittent impacts and variance in peak energy generation.
Facilities	Impacts would be considered significant if facility, infrastructure, and landscape modifications: <ul style="list-style-type: none"> • Were not consistent with the surrounding facilities and would detract from their intended purposes. • Or would burden and/or diminish the ability to operate existing facilities.

Resource Topics	Significance Threshold
Geology and Soils	<p>Impacts would be considered significant if they:</p> <ul style="list-style-type: none"> • Substantially degrade soils, soil fertility, soil productivity, or geologic resources.
Hazardous Materials, Hazardous Waste, and Safety	<p>Impacts would be considered significant if they would result in:</p> <ul style="list-style-type: none"> • An unacceptable risk of exposure or impact to human health and safety regarding the amount of materials or waste to be handled, stored, used, or disposed of, or probable regulatory violation. • Site contamination conditions would preclude development of the site for the proposed use.
Land Use	<p>Impacts would be considered significant if:</p> <ul style="list-style-type: none"> • An action would not be consistent with the surrounding land use. • Or an action would not conform to zoning and community land use plans and policies. • A development exceeding 5,000 ft² did not include green infrastructure/low impact development.
Noise	<p>Impacts would be considered significant if:</p> <ul style="list-style-type: none"> • Noise levels on the Installation would exceed compatibility standards for noise zones at FLW. • Occupational noise levels exceed 85 dB for an 8-hour day.
Socioeconomics and Environmental Justice	<p>Impacts would be considered significant if the estimated impacts on socioeconomic issues, such as employment, business volume, population, and income, would:</p> <ul style="list-style-type: none"> • Exceed the RTV for a particular resource topic, as indicated by the Economic Impact Forecast System model. • Affect a large number of individuals, groups, businesses, or government entities and/or be readily detectable and observed and/or occur over a wide geographic area and have a substantial influence on social and/or economic conditions. <p>An environmental justice impact is considered to be significant if the impact from an Action Alternative disproportionately and adversely affects a minority or low income community.</p> <p>An impact to a population of children is considered to be significant if the impact from an Action Alternative disproportionately and adversely affects this population of children.</p>
Utilities and Services	<p>Impacts would be considered significant if the Proposed Actions would require more utility service than could be reliably provided and sustained by the combination of available utility providers, system and sources.</p>

Resource Topics	Significance Threshold
Water Resources	Impacts would be considered significant if they: <ul style="list-style-type: none"> • Alter the existing pattern of surface or groundwater flow or drainage in a manner that would adversely affect the uses of the water within or outside the region. • Degrade surface or groundwater quality in a manner that would reduce the existing or potentially beneficial uses of the water. • Would be out of compliance with existing or proposed water quality standards or other regulatory requirements related to protecting or managing water resources. • Would not comply with the CWA. • Would not comply with the Safe Drinking Water Act.
Transportation and Traffic	Impacts would be considered significant if: <ul style="list-style-type: none"> • Level of service is reduced to unacceptable levels (LOS E and LOS F), or • Intersections and gates would reach capacity and extensive delays would develop.

Notes: CAA – Clean Air Act, CFR – Code of Federal Regulations, CWA – Clean Water Act, dB – decibel, LOS – level of service, FLW – Fort Leonard Wood, NAAQS – National Ambient Air Quality Standards, RTV – rational threshold value

Impacts also are characterized as short term or long term. Short-term effects typically are those that would be temporary and associated with the construction phase but would no longer be perceptible once construction is completed or shortly thereafter. Long-term effects are those that would be permanent or would persist for the operational life of the project.

3.1.1 Resource Areas Carried Forward for Analysis

Army NEPA Regulations (32 CFR §651.14) state the NEPA analysis should reduce or eliminate discussion of minor issues to help focus analyses. This approach minimizes unnecessary analysis in the document and discussion during the NEPA process. The CEQ regulations for implementing NEPA (40 CFR §1500.4(g)) emphasizes implementing the scoping process not only to identify significant environmental issues deserving of study, but also to deemphasize insignificant issues, narrowing the scope of the environmental assessment/environmental impact statement process. After consideration of the anticipated impacts associated with the proposed alternatives, the following resource topics were selected to be carried forward for detailed analysis in this PEA:

- Air Quality
- Biological Resources (including wildlife, vegetation, and sensitive species)
- Cultural Resources
- Energy

- Facilities
- Geology and Soils
- Hazardous Materials, Hazardous Waste, and Safety
- Land Use
- Noise
- Socioeconomics and Environmental Justice
- Utilities and Services
- Water Resources
- Transportation and Traffic

3.1.2 Resource Areas Dismissed from Further Analysis

After consideration of the anticipated impacts associated with the proposed alternatives, the following resource area was dismissed from further analysis for the reasons described:

- **Airspace**—The Federal Aviation Administration has designated the majority of airspace at FLW as restricted airspace for training and range activities and activities associated with Waynesville-St. Robert Regional Airport. Within FLW, restrictions are generally limited to range and training areas, whereas the Main Cantonment and the northwest portion of FLW are unrestricted (U.S. Army 2011). Airspace restrictions vary based on height and location. Although the majority of airspace at FLW is restricted, in the Main Cantonment where the majority of the Proposed Actions would be implemented, airspace is not restricted. The airspace in this area is considered uncontrolled, Class G airspace. This class of airspace extends from the surface of the ground to the base of the overlying Class E airspace, which is controlled airspace starting at 14,500 feet mean sea level (Federal Aviation Administration 2008). As a result, the Proposed Actions are not anticipated to affect airspace at FLW; therefore, airspace is not discussed in further detail in this PEA.

3.2 Air Quality

3.2.1 Affected Environment

The ROI for air quality is Pulaski County—the general area that emissions from FLW could affect. In addition to regional air quality impacts, air quality impacts are also considered at a local level in the vicinity of stationary sources and roadways/intersections.

The United States Environmental Protection Agency (USEPA) defines ambient air in 40 CFR §50.1(e) as “that portion of the atmosphere, external to buildings, to which the general public has access.” In compliance with the 1970 Clean Air Act (CAA) and the 1977 and 1990 CAA Amendments, the USEPA has promulgated National Ambient Air Quality Standards (NAAQS). The NAAQS were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the USEPA has issued NAAQS for the following criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter (particles with a diameter less than or equal to a nominal 10 micrometers [PM₁₀]) and particles with a diameter less than or equal to nominal 2.5 micrometers [PM_{2.5}]), ozone (O₃), nitrogen dioxide (NO₂), and lead (Pb).

3.2.1.1 Air Quality General Conformity

Federal regulations designate Air Quality Control Regions in violation of the NAAQS as nonattainment areas. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme. The USEPA classifies Pulaski County as in attainment for all criteria pollutants. The NAAQS for all criteria pollutants are listed in Table 3-2.

Table 3-2. National Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard
Carbon monoxide	8 hours	9 ppm
	1 hour	35 ppm
Lead	Rolling 3-month average	0.15 µg/m ³
Nitrogen dioxide	1 hour	100 ppb
	Annual	53 ppb
Ozone	8 hours	0.075 ppm
Particulate matter ₁₀	24-hour average	150 µg/m ³
Particulate Matter _{2.5}	Annual	12 µg/m ³
	24 hours	35 µg/m ³
Sulfur dioxide	1shour	75 ppb

Source: USEPA (2014a)

Notes: µg/m³ – micrograms per cubic meter, ppb = parts per billion, ppm = part per million

To regulate the emission levels resulting from a project, federal actions located in nonattainment or maintenance areas are required to demonstrate compliance with the general conformity guidelines established in 40 CFR §93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (the Rule). Because FLW is located in an attainment area, the Rule does not apply to this Proposed Actions.

3.2.1.2 Air Permit Requirements

Title V Permit

FLW operates under a Title V permit (Permit No. OP2006-005; 1 February 2006) (MDNR 2006). The current permit expired on 31 January 2011. FLW applied for a permit renewal on 29 June 2010; however, per the Missouri Department of Natural Resources (MDNR), the permit is still pending (MDNR Undated). A revised permit is anticipated in July 2016 (Flier 2016). FLW is classified as an existing Major Source and has the potential to emit more than 100 tons per year of nitrogen oxide (NO_x), sulfur oxides (SO_x), PM₁₀, CO, and volatile organic compounds (VOCs) (MNDR 2006).

Existing Ambient Air Quality Concentrations

Because Pulaski County is in attainment for all criteria pollutants, no air monitoring stations monitor the ambient air quality in the county. All ambient air quality concentrations of criteria pollutants are presumed to be below the thresholds provided in Table 3-2.

3.2.1.3 Meteorology/Climate

Temperature is a parameter used in calculating emissions for air quality applicability. The temperature at FLW ranges from an average of mid-30s in January to mid-80s in July. Winters are cold and summers are hot; however, prolonged periods of very cold or very hot weather are unusual in the humid, continental climate. FLW receives an annual average precipitation of 42 inches with half of the rainfall occurring during the spring (U.S. Army 2006).

3.2.1.4 Air Emissions

As part of compliance with air quality regulations, FLW is required to prepare and submit an annual Emission Inventory Questionnaire. Construction emissions are not included in the calculation of annual emissions because these emission sources are short term and not regulated by Title V of the CAA. Stationary emission sources at FLW include boilers and generators associated with power plants, rock crushing plants, and asphalt storage vessels, as well as a chemical defense training facility, chemical and military police training schools, and associated equipment. Table 3-3 shows FLW's operational emissions in 2013.

Table 3-3. Criteria Air Pollutant Emissions at FLW in 2013

Year	NO _x	SO ₂	PM ₁₀	PM _{2.5}	Pb	CO	VOCs
	(tons per year)						
2013	44.45	2.99	3.28	1.91	0.00	15.17	2.70

Source: Flier (2015)

Notes: CO – carbon monoxide, NO_x – nitrogen oxide, PM_{2.5} – fine particulate matter, less than or equal to 2.5 microns in diameter, PM₁₀ – particulate matter with a diameter less than or equal to nominal 10 micrometers, SO₂ – sulfur dioxide, VOC – volatile organic

3.2.1.5 Regional Air Quality Index Summary

The USEPA calculates the Air Quality Index (AQI) for five major air pollutants regulated by the CAA: ground-level O₃, particulate matter, CO, SO₂, and NO₂. The USEPA collects data daily to determine air quality for the region and releases it in the form of the AQI. The AQI ranges from zero to 500—zero being no air pollution and 500 representing severely unhealthy air pollution levels. An AQI value between 101 and 150 indicates that air quality is unhealthy for sensitive groups who may be subject to negative health effects. Sensitive groups may include those with lung or heart disease who will be more negatively affected by lower levels of ground level O₃ and particulate matter than the rest of the general public. An AQI value between 151 and 200 is considered to be unhealthy and may result in negative health effects for the general public, and more severe effects are possible for those in sensitive groups. AQI values greater than 200 are considered very unhealthy. An AQI greater than 300 represents hazardous air quality (USEPA 2015a).

3.2.1.6 Greenhouse Gases

There is broad scientific consensus that humans are changing the chemical composition of the earth's atmosphere. Activities, such as fossil fuel combustion, deforestation, and other changes in land use, are resulting in the accumulation of trace GHGs, such as carbon dioxide (CO₂), in the atmosphere. An increase in GHG emissions is said to result in an increase in the earth's average surface temperature, which is commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, the average sea level, ocean acidification, chemical reaction rates, and precipitation rates, all of which is commonly referred to as climate change. The best estimates of the Intergovernmental Panel on Climate Change are that the average global temperature rise between 2000 and 2100 could range from 0.6 degrees Celsius (1.08 degrees Fahrenheit) (with no increase in GHG emissions greater than year 2000 levels) to 4.0 degrees Celsius (6.66 degrees Fahrenheit) (with substantial increase in GHG emissions) (Intergovernmental Panel on Climate Change 2007). Even small increases in global temperatures could have considerable detrimental impacts on natural and human environments.

GHGs include water vapor, CO₂, methane, NO_x, O₃, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. A gas's global warming potential provides a relative basis for calculating its carbon dioxide equivalent (CO₂e), which is a metric measure used to compare the emissions from various GHGs based on their global warming potential. CO₂ has a global warming potential of 1 and is therefore the standard to which all other GHGs are measured.

Water vapor is a naturally occurring GHGs and accounts for the largest percentage of the greenhouse effect. Next to water vapor, CO₂ is the second-most abundant GHGs. Uncontrolled CO₂ emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because CO₂ and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend on the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions).

GHG emissions from federal installations are the subject of numerous policy and planning documents, including Executive Order 13693, *Planning for Federal Sustainability in the Next Decade*, which calls for a 40 percent reduction in federal GHG emissions by 2040 compared to 2008 levels. In 2014, the DoD released its *Strategic Sustainability Performance Plan* (DoD 2014). Numerous Installation sustainability and energy conservation initiatives have been completed at FLW as discussed in the list of past actions in Chapter 4, *Cumulative Impacts*.

Baseline Greenhouse Gas Emissions at Fort Leonard Wood

GHG emission sources at FLW include boiler plants and other boilers that use natural gas, propane, and fuel oil for space heating, hot water, and other activities including prescribed burns. FLW also reports methane from closed landfills on the Installation. No specific monitoring of these emission sources has occurred.

3.2.2 Environmental Consequences

3.2.2.1 Alternative 1 – No Action

Under Alternative 1, less than significant, short-term air quality impacts could occur from informal construction of facilities at FLW inside the framework of the existing RPMP. These construction-related emissions for facilities would be similar to those discussed in Sections 3.2.2.2 through 3.2.2.4 for the Action Alternatives. New stationary sources of air emissions or major changes to existing stationary

sources would not occur under Alternative 1. Similarly, transportation-related mobile source emissions would not change because no roadway/transit/pedestrian improvements would be constructed.

Overall, impacts to air quality under Alternative 1 would be adverse, but less than significant, as a result of continued emissions from informal construction.

3.2.2.2 Impacts Common to Both Action Alternatives

Short-term Air Quality Impacts Associated with Construction and Maintenance

Multiple elements common to the Action Alternatives involve short-term emissions associated with construction and/or maintenance activities, including construction of a potential light rail transit system, new sidewalks and trails, a power plant and/or CHP plants, and building projects within the ADP districts, including identified short-term projects and removal of concrete from channels and widening of channels as part of the Green Infrastructure Plan. Construction-related air quality impacts would result from direct emissions from construction equipment used for activities, such as land clearing, site preparation (i.e., demolition, excavation/fill, trenching, and grading), gravel and concrete work, paving, and building. Typical construction equipment could include bulldozers, backhoes, scraper/hauler/excavators, graders, compactors, concrete mixers, cranes, rollers, paving machines, pile drivers, fork lifts, diesel generators, and dump trucks, concrete trucks, and delivery trucks. The type and number of pieces of construction equipment would vary depending on the requirements for each construction project. Emissions would also result from construction workers commuting to and from the construction site in personal vehicles. Emissions associated with construction equipment would include VOCs, CO, NO_x, SO_x, PM₁₀, and PM_{2.5}. Construction equipment and construction worker commutes would also release GHG emissions. The movement of equipment and demolition and excavation activities would result in fugitive dust emission (primarily PM₁₀) in dry weather.

The total emissions in any particular area would vary depending on the currently unknown details of each project. Emissions would generally be proportional to the size of the project. Similarly, fugitive dust emissions would generally be proportional to the area of soil exposed and quantity of excavation; however, because the projects are anticipated to be constructed over a 20 year time frame and the relatively small scale of potential projects, the emissions in any particular year would be less than significant. Construction-related air quality impacts could be further reduced through implementation of standard BMPs, such as implementing dust control measures (e.g., covering trucks, watering exposed soil in dry weather, and promptly seeding/covering exposed areas), limiting idling of equipment, encouraging contractors to use newer model construction equipment, and ensuring proper equipment maintenance.

Long-term Impacts of Transit Network Plan

Overall, the Transit Network Plan would have long-term, beneficial effects on air quality. FLW anticipates that phasing out older diesel buses and replacing them with hybrid electric or natural gas buses would reduce particulate matter, NO_x emissions, and CO₂ emissions. It should be noted that the reduction in emissions would be due to both the switch in bus technology and the use of newer model year buses. Replacing older diesel buses with new diesel buses would also serve as an effective strategy to substantially reducing bus transit-related air pollutant emissions (MJB&A 2013). Newer model diesel buses have much lower emissions due to the phase in of new emissions standards over time and improvements in pollution control technology.

Depending on the degree to which people on the Installation use the bus service, ridership increases resulting from increasing bus service options could reduce single occupant vehicle travel and emissions of criteria pollutants and GHG emissions (FTA 2009). Emissions per passenger mile are dependent on vehicle occupancy, with the U.S. average of one quarter occupancy, bus CO₂e emissions per passenger mile are 32 percent lower than autos, but this savings increases to 83 percent when the bus is fully occupied (FTA 2009). The extent to which the Transit System Plan will impact ridership and auto travel is not currently known.

A potential light rail system at FLW, if found to be feasible, could further increase transit ridership and reduce mobile emissions, potentially resulting in long-term, beneficial impacts. FTA estimates a typical light rail system emits 57 percent fewer CO₂e emissions per passenger mile compared to a single occupancy vehicle. Additional detailed studies of the transportation and environmental impact of such a transit system would be required (as part of tiered NEPA studies) if it is found to be feasible and funded.

Long-term Impacts of Pedestrian Network Plan

Similar to the transit impacts, discussed previously, to the extent pedestrian infrastructure improvements reduce driving, long-term, beneficial impacts to air quality would result.

Long-term Impacts of Green Infrastructure Plan

The Green Infrastructure Plan could have long-term, beneficial GHG implications in terms of carbon sequestration by adding vegetated areas and naturally functioning riparian areas (USEPA 2014b).

Long-term Impacts of Utilities Framework Plan

The potential for biofuel crops would have complex implications for GHG emissions, although overall the effect is expected to be beneficial. The net GHG savings from biofuels depends on factors such as the type of feedstocks produced, the management practices used to produce them, and prior land use (NAS

2011). These issues would be considered in greater detail during a future tiered NEPA evaluation of specific oilseed crop production proposals.

The Utilities Framework Plan includes a new power plant at FLW. The specific location, fuel type, and capacity of the power plant is not currently known; therefore, detailed impact analysis is deferred to future tiered NEPA reviews. In general, however, a power plant would be expected to have emissions of criteria pollutants at a long-term, less than significant to significant, but mitigatable level, with the level of impacts varying dependent on power plant construction details. Mitigation measures would include using pollution control equipment required by state and federal air quality regulations and implementing engineering design of the exhaust stack to prevent excessive downwind pollutant concentrations. If the power plant is classified as a major source, permitting under the Prevention of Significant Deterioration Program could be required, mandating Best Available Control Technology and a demonstration of no violations of air quality standards (USEPA 2015b). The net effect of a new power plant on GHG emissions would depend on the fuel type, plant efficiency, and the efficiency of the off-Installation power plants that the new plant's electricity would displace.

In addition to the direct emissions from the power plant, the production and transportation of fuel (whether biofuel or fossil fuel) would result in emissions. The means by which fuel would be conveyed to the power plant will be addressed in future tiered NEPA reviews.

Similar to the power plant discussion, CHP plants could have significant, but mitigatable criteria pollutant emissions. CHP plants would have the potential to substantially reduce GHG emissions because they are more efficient than plants that produce heat and electricity separately (USEPA 2014c).

Long-term Impacts of Development within Area Development Planning Districts

Development within the ADP districts, including constructing those projects identified as short-term projects in Table 2-4, is expected to result in the demolition of existing building space and the construction of new building space that would more than offset the space demolished, as described above in Table 2-2. While the net increase in building space is expected to increase overall energy consumption and GHG emissions on the Installation, this impact would be at least partially offset by the increased energy efficiency of new buildings compared to those being replaced and the potential incorporation of renewable energy features into new buildings. Building-related heating and hot water emissions would be generated onsite by boilers (primarily natural gas). Electricity could continue to generate emissions at offsite power plants or could shift to onsite if a power plant capable of meeting all or part of the Installation's electricity demand is constructed. Changes in onsite heating and electrical generation systems would be required to comply with air quality permitting requirements (e.g., modification of the

Installation's existing permit, as appropriate). The long-term impact of additional building facilities is expected to be less than significant.

Overall, the impacts from actions common to both alternatives range from beneficial to adverse, significant but mitigable. Beneficial impacts would occur as a result of a reduction in emissions resulting from a transition to more efficient vehicles, and potential reduction in vehicle trips, as well as from additional vegetated and riparian areas. Less than significant impacts would occur from short-term construction emissions and the construction of sustainable buildings, potentially significant but mitigable impacts would occur from power plant construction and operational emissions.

3.2.2.3 Alternative 2 – Spine Roadway Option

Construction of Alternative 2, the Spine Roadway Option, would result in short-term air pollutant emissions, similar to those discussed for Alternative 1 and impacts common to both Action Alternatives.

The Spine Roadway Option and associated improvements, such as roundabouts, would result in benefits for the Installation by reducing congestion, which in turn would reduce criteria pollutant and GHG emissions. Detailed traffic projections (e.g., vehicle miles travelled and intersection level of service) are not currently available to provide a more detailed assessment of air quality impacts. These issues would be addressed in future tiered NEPA studies.

Overall, the Spine Roadway Option would result in less than significant, adverse impacts to air quality from construction emissions.

3.2.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Construction of Alternative 3, the Loop Roadway Option, would result in short-term air pollutant emissions, similar to those discussed for Alternative 1 and impacts common to both Action Alternatives.

The Loop Roadway Option would result in less than significant, adverse impacts.

The Loop Roadway Option and associated improvements, such as roundabouts, would result in benefits for the Installation by reducing congestion, which in turn would reduce criteria pollutant and GHG emissions. Detailed traffic projections (e.g., vehicle miles travelled and intersection level of service) are not currently available to provide a more detailed assessment of air quality impacts. These issues would be addressed in future tiered NEPA studies.

Overall, the Loop Roadway Option would result in less than significant, adverse impacts to air quality from construction emissions.

3.3 Biological Resources

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are generally referred to as vegetation and animal species are referred to as wildlife. Habitat can be defined as the resources and conditions present in an area that produces occupancy of a plant or animal (Hall et al. 1997). Although the existence and preservation of biological resources are intrinsically valuable, these resources also provide aesthetic, recreational, and socioeconomic values to society. For purposes of this analysis, these resources are divided into three major categories: vegetation, wildlife, and sensitive species.

3.3.1 Affected Environment

The ROI for biological resources is limited to the boundaries of FLW because potentially affected resources would be confined to this localized area.

3.3.1.1 Vegetation

Forest covers approximately 75 percent of the land of FLW; old fields and grasslands occupy another 15 percent; and the remaining 10 percent consists of improved grounds, structures, and paved areas. According to the Integrated Natural Resource Management Plan (INRMP) (FLW 2006), six rare plant species have been documented at FLW, all occurring within proximity to the riparian zones outside the Main Cantonment.

Vegetation on FLW is diverse. Within the Natural Divisions of Missouri, FLW is located in Missouri's Ozark Natural Division, Upper Ozark Section. The MDNR and the Missouri Department of Conservation (MDC) developed classifications for the terrestrial natural communities of Missouri (MDNR 1987) that are based on substrate, moisture, and/or dominant plants. FLW has approximately 40 different natural communities based on this classification. Dominant plant community types include upland forest, bottomland forest, savanna, prairie, marsh, and swamp. Figure 3-1 illustrates the general location of these vegetative communities at FLW.

Surveys

Little botanical work had been conducted prior to the preparation of the *Floral Inventory of Fort Leonard Wood* (FLW 2006). During this inventory, surveyors for the Oklahoma Biological Survey collected 1,370 plants representing 681 taxa. According to a survey conducted by Skinner (1991) that identified four rare plant species on FLW, the Oklahoma Biological Survey's 1990 survey should have noted only 647 taxa. Surveys of the flora, fauna, and natural features present at FLW continued to be conducted by Range and Training Land Assessments field crews from 1989 through 2001. These collections include approximately

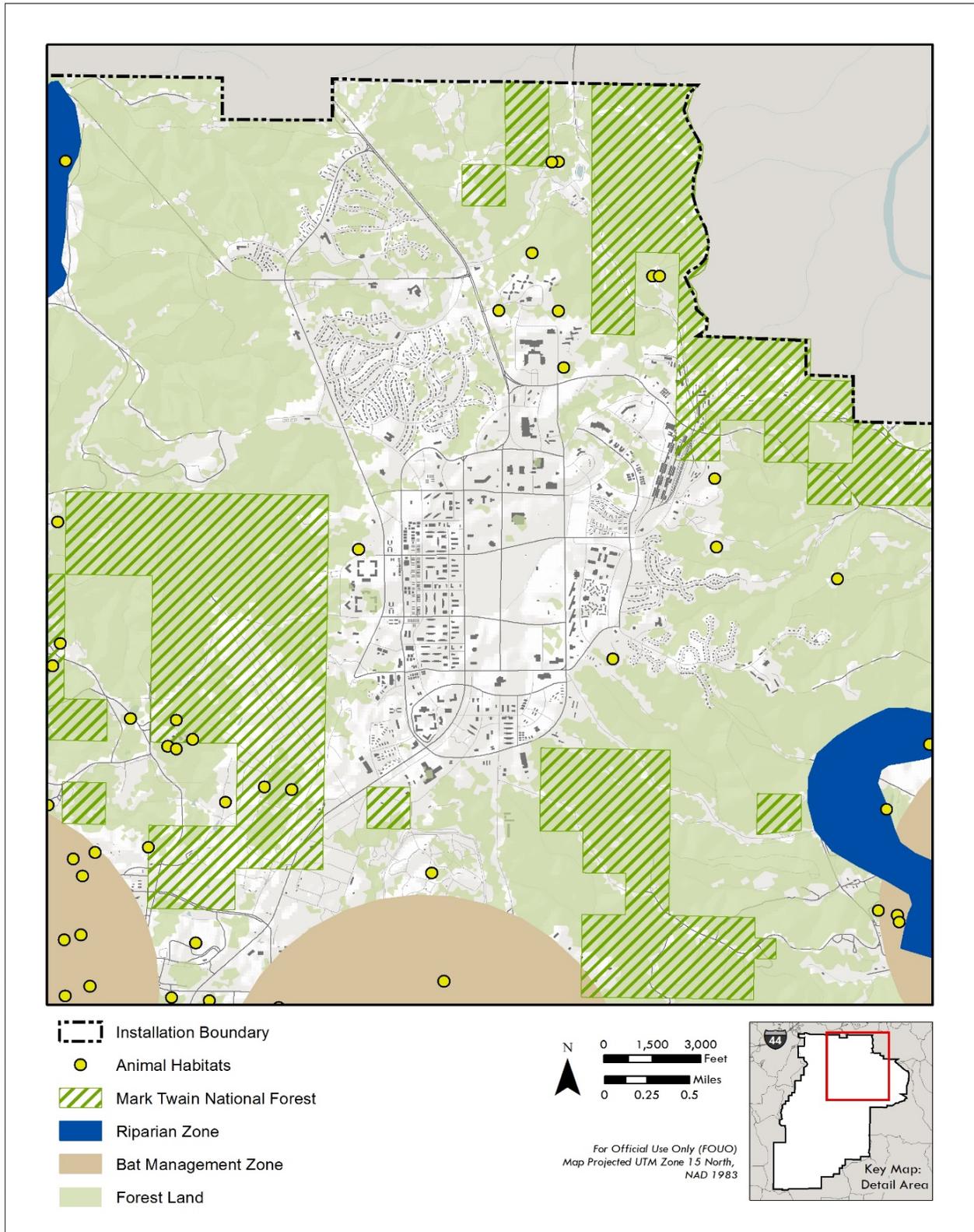


Figure 3-1. Vegetation on Fort Leonard Wood

681 species in 361 genera and 109 families (FLW 1997). The current plant list for FLW is available in the INRMP and contains 765 species of plants that are known to occur or are possible to occur based on literature review.

Surveys of the flora, fauna, and natural features present at FLW have been conducted through the Legacy Resource Management Program, which is funded by the DoD and involves the Natural History Division of the MDC and The Nature Conservancy. The Oklahoma Biological Survey conducted a floral inventory of FLW in 1989. In addition to creating an index to the botanical species at FLW, the survey established a herbarium collection with specimens being located at FLW and the U.S. Army Construction Engineering Research Laboratory (USACERL). Further surveys could increase the total number of species of native plants found (Skinner 1991).

Forest

Forest cover—the principal vegetative type at the Installation—covers approximately 75 percent of FLW (FLW 2006). Although the oak-hickory association is dominant, the sycamore-elm-soft maple association is frequently found along creeks and river bottom lands. The vegetative cover on north-facing slopes consists of black, red, and white oaks with an understory of dogwood, shadbush, and redbud. As the landform orientation becomes southerly, the plant composition changes to post oak, blackjack oak, and black hickory. Other common species present include black cherry, sugar maple, hawthorn, slippery elm, hackberry, buckeye, and hornbeam. Herbaceous understory is mostly absent on the dry uplands with closed canopies but may include bush clover, panic grass, Virginia creeper, poverty oat grass, and wood sorrel when the canopy is more open. Moist bottomland forests have a denser understory that contain pale violet, greenbriar, bellflower, jewelweed, mayapple, and golden ragwort. Several shortleaf pine stands are located throughout the Installation.

Grasslands

Old fields and grasslands occur approximately 15 percent of the Installation (FLW 2006). A prescribed burn program maintains these habitats. Common growths of old fields include broom sedge, a mix of legumes, Kentucky bluegrass and tall fescue (both introduced), and tall, native, warm season perennial grasses. Low woody growth commonly includes dewberry, blackberry, rose, sumac, and persimmon. Invading trees are post oak, blackjack oak, black hickory, and eastern red cedar. Native, deep rooted, perennial plants are becoming reestablished and spreading in non-forested areas that are less often disturbed by training activities. Native grassland species that have been noted include Indian grass, little bluestem, big bluestem, switchgrass, sideoats grama, leadplant, Virginia lespedeza, roundhead lespedeza, white prairie clover, butterfly milkweed, purple coneflower, compass plant, and prairie dock.

Landscaped, Developed, and Disturbed Areas

The remaining 10 percent of FLW consists of improved grounds, structures, and paved areas. Most of the native vegetation has been removed from much of the Main Cantonment, heavy equipment training sites, and some of the firing ranges. Some landscaped areas still contain native tree species such as post and white oaks. Tall fescue and Kentucky bluegrass are the most common landscape grasses. An abundance of weed species exist in most turf areas.

High-quality Natural Communities

Although few high-quality natural communities occur on FLW as a result of varying degrees of disturbance from past land use practices, the INRMP identifies four areas contained in the ranges and training areas as high quality natural communities, including:

- Falls Hollow Sandstone Glades—This area includes four glades and is the largest known from Missouri on the Ordovician Roubidoux geologic formation. It has an MDC ranking of *significant*.
- Pond Marsh—This sinkhole pond is located west of Forney Army Airfield, is about 4 acres in size, and is damp in dry years.
- Dry-mesic Chert Forest—This 300-acre area has no recent disturbances, and it has an MDC ranking of *notable*.
- Dry Dolomite Cliff—Also ranked as *notable*, the cliff is approximately 4,000 feet long and 250 feet high. It is along Big Piney River, which has an MDC ranking of *exceptional* for small river and aquatic communities.

3.3.1.2 Wildlife

Diverse habitats exist within and in proximity to FLW's boundaries. These habitats provide quality conditions for a wide variety of fish and wildlife. More than 1,300 species of plants, animals, and invertebrates have been noted at FLW. Surveys for fish, mussels, small mammals, birds, reptiles, and amphibians have been conducted at FLW (USACE 1997a). Common wildlife includes many species of mammals, birds, amphibians, reptiles, fish, mussels, and invertebrates (FLW 2006). The Installation's Natural Resource Branch maintains lists of wildlife species known to occur on FLW.

Resident wildlife species are also inventoried by the DPW, Natural Resources Branch and for the Land Condition Trend Analysis Program. In addition, FLW participated in the Monitoring Avian Productivity and Survival Project from 1999 through 2010, which was part of the Partners in Flight Program that was funded, in part, through the DoD's Legacy Resource Management Program. This program supported the conservation and management of Neotropical migratory birds and their habitats on DoD lands. Six

Monitoring Avian Productivity and Survival project stations were established on the Installation during 1993 to monitor production and survival. According to the INRMP, data would be collected periodically at these stations as long as funding continues to be available.

FLW has a long history of scientific surveys, studies, and monitoring conducted on its lands to monitor biological resources and the effects of military actions on them. Because of FLW's proactive management policy and implementation of BMPs and reasonable and prudent measures, no evidence has arisen to indicate that on-going mission activities have adversely affected or degraded the natural resources on FLW (FLW 2006; Oklahoma Biological Survey 1990; USACE 1997b; USFWS 2006). Additionally, fish tissue sampling and testing has not indicated any evidence of bioaccumulation of harmful substances (USACE 2002).

Mammals

Fifty-three species of mammals exist at FLW. The most common mammals encountered at FLW include the eastern cottontail rabbit, eastern gray squirrel, beaver, coyote, raccoon, striped skunk, and white-tailed deer. During surveys for two endangered bat species, the red bat, eastern pipistrel, Keen's bat, small footed bat, little brown bat, big brown bat, hoary bat, and silver haired bat were also noted (FLW 2006).

Birds

A total of 211 species of birds is known to use FLW for either nesting or migration, and many are year-round residents (FLW 1994, USACERL 1998). The large number of birds observed at FLW is due to the large size of the Installation, geographic location, and the diversity of habitats present.

Neotropical migrants are land birds that breed in temperate America and winter in the New World tropics (National Fish and Wildlife Foundation 1992). A total of 144 species of Neotropical migrants is known to occur on FLW, including several species of warblers, vireos, and thrushes. Approximately 51 percent of these species is also reproducing on the Installation (USACERL 1998). Raptors at FLW include the red-tailed hawk, great horned owl, barred owl, and eastern screech owl. Bald eagles have been observed as transients along Roubidoux Creek and Big Piney River during annual winter surveys. Shorebirds identified at FLW that are considered to be transients include the spotted sandpiper, least sandpiper, lesser yellowlegs, greater yellowlegs, and Wilson's phalarope. Waterfowl considered to be common transients include the Canada goose, northern pintail, mallard, American widgeon, northern shoveler, blue-winged teal, gadwall, and hooded merganser. The wood duck is considered to be a common resident.

According to a USACERL (1998) study, species composition is similar to the surrounding Mark Twain National Forest, except FLW has a greater number of bird species that prefer forest edge and brushy areas. Species adapted to the forest interior are more prevalent in the Mark Twain National Forest.

Amphibians and Reptiles

A total of 22 amphibian species and 37 reptile species has been found at FLW (USACERL 1998). Some of the amphibians include the bull frog, southern leopard frog, cave salamander, and dark-sided salamander. Reptiles include species such as the common snapping turtle, three-toed box turtle, northern water snake, five-lined skink, black rat snake, eastern garter snake, western cottonmouth, and Osage copperhead (USACERL 1998).

Fish

Fish populations and densities in streams and lakes on FLW occur at expected levels. Fish surveys of Big Piney River, Roubidoux Creek, and semi-permanent streams associated with Musgrave, Turnbull, Ballard, Falls, Hurd, and McCann Hollows, and East Gate Road were conducted between April 1994 and October 1995. A total of 65 species representing 13 families of fish was collected or observed during this survey (USACERL 1998). A total of 53 species was identified in the Big Piney River, while 40 species were identified in the Roubidoux Creek. Previous data based on a fish survey that MDC conducted 1993–1995 indicate that 75 species of fish inhabited the Big Piney River and 43 species occurred in Roubidoux Creek. The differences in species between the two studies may be attributed to differing sampling methods. Species commonly found in the streams and ponds in the FLW area include the golden redhorse, smallmouth bass, largemouth bass, green sunfish, longear sunfish, bluegill, rock bass, channel catfish, shiners, and minnows.

Mussels

Twenty-seven species of unionid mussels and one clam species were found during surveys of FLW streams and rivers (USACERL 1998). Representatives of all 27 species were found in the Big Piney River and 15 species were found in Roubidoux Creek. The most frequently encountered mussels in the Big Piney River were, in order of frequency, the mucket, ellipse, Wabash pigtoe, and *Lampsilis reeviana*. The most abundant species in Roubidoux Creek were the spike, *Lampsilis reeviana*, and ellipse. The survey concluded that the mussel fauna was relatively diverse and has probably changed little since prehistoric times.

Invertebrates

Benthic invertebrate samples collected in February 1996 indicate that a healthy community of invertebrates was present (USACE 1996a). At least 142 different genera or species of bottom dwelling organisms are known to occur in the Big Piney River and Roubidoux Creek. The invertebrate fauna is typical of many large Ozark streams, being dominated in number by mayflies, caddisflies, and stoneflies.

Crayfish

Crayfish fauna at FLW is not very diverse. Two common species are known to occur—the golden crayfish and spothanded crayfish. Both of these species were numerous within the FLW area and were found in most of the streams with the exceptions of those running through Hurd Hollow and McCann Hollow (USACERL 1998).

Another crustacean known to occur on FLW is the cave dwelling Central Missouri cave amphipod, which is known from one cave on FLW (USACERL 1998).

Insects

Insect and arachnid life is abundant on FLW. Species of chiggers, ticks, flies, mosquitoes, and gnats are common. A wide variety of spiders, including the black widow and brown recluse, are frequently found in buildings. FLW has no history of outbreaks of devastating or destructive insects.

3.3.1.3 Sensitive Species

According to the INRMP, six rare plant species have been documented at FLW, all occurring within proximity to the riparian zones outside the Main Cantonment (FLW 2006).

FLW provides habitat for four federally and state-listed endangered bat species and the state-listed endangered bald eagle.

Three federally listed endangered bats are located on the Installation. Surveys for the endangered bats indicated that either bats were observed or conditions indicated that bats had used 26 caves on the Installation (Oesch 1986). New rankings on the biological significance of each cave would result from an ongoing Cave Survey Project funded by the Legacy Resource Management Program (FY 2002–2003). The first year's findings have been completed and are on file at the Environmental Division (Ahler et al. 2003). Once completed, this report will replace the earlier work conducted by Oesch.

FLW has six bat management areas. These areas are divided into three zones, each having different restrictions. The largest zone extends up to 6,337 feet from residing caves.

In addition, the federally listed spectaclecase mussel is known to exist in shallow areas in larger rivers and streams and has been sighted in the Big Piney River on FLW. Although vulnerable, it has been found during surveys in multiple locations on the Big Piney River, both on and off FLW, by the MDC in 1994 and 2005 and by FLW natural resource staff in 2012 (FLW 2014a).

The bald eagle has been sighted along the Roubidoux Creek and Big Piney River. An active nest has been identified along the Big Piney River. FLW has established a buffer zone to prevent potential disturbances.

The INRMP discusses more detailed information about the Installation's management of biological resources. Habitats and associated critical buffers are primarily located on the fringe of developed areas, and no animal habitats occur at the center of the Main Cantonment. Aforementioned critical or sensitive areas, such as riparian zones, bat management zones, and bald eagle buffer zone are all located within the training and range area away from the Main Cantonment.

Indiana Bat

The Indiana bat was listed as endangered in 1967. The range-wide population of the species is declining. Population decreases have been most dramatic in Missouri (USFWS 1983). Four caves (Brooks, Davis No. 2, Wolf Den, and Joy) on FLW support declining numbers of hibernating Indiana bats during the winter months (September–April). Hibernating populations also occur in Great Spirit Cave, 3.5 kilometers west of the Installation; Ryden Cave, 6 kilometers southeast of FLW; and Knife Cave, 1.5 kilometers west of FLW (FLW 2007). Indiana bat populations in most caves on and near FLW have declined. Populations in Brooks Cave have declined more than 90 percent since the 1970s. The population in Great Spirit Cave was low but stable through the early 1990s but declined dramatically in the 1997 survey with the 2004 population only 5 percent of the highest recorded population. The population in Ryden Cave has declined steadily since 1979. Survey data from small sample sets indicate negative population trends in Wolf Den, Davis No. 2, and Joy caves. Most Indiana bats hibernating in caves on FLW are thought to migrate to northern Missouri or Iowa during summer months to establish dispersed maternity colonies. No designated critical habitat for this species occurs on FLW.

Indiana bats also are found during spring, summer, and fall months on FLW. In 1994, 1997, and 2001, Indiana bats were captured in mist nets within FLW boundaries. Three Indiana bats were captured in 1994, two Indiana bats were captured in 1997, and one Indiana bat was captured in 2001. Captured bats likely were foraging or traveling between roost sites and foraging areas. Two of the captures were reproductive females, indicating at least one maternity roost located on or near FLW. The remaining captures were non-reproductive males. It is likely males captured at FLW were roosting and foraging on FLW. Female Indiana bats active on the Installation during summer may migrate to FLW from other locations. Female Indiana bats primarily bear young in maternity roosts in hollow or loose-barked trees. Summer habitat of marginal or better quality is common on FLW. Any of the forested acres on FLW or in proximity to FLW may provide potentially suitable summer foraging and roosting habitat for Indiana bats (FLW 2007).

The INRMP delineates management zones and use restrictions related to activities conducted on the Installation around known Indiana bat caves. Habitat management guidelines on the Installation were developed in coordination with the MDC and the U.S. Fish and Wildlife Service (USFWS) during the

preparation of biological assessments (BAs) completed for the FLW ongoing mission and for proposed BRAC activities at FLW. Biological opinions (BOs) issued by the USFWS on these BAs identify additional management guidelines (FLW 2007). Three management zones have been defined as follows:

- **Endangered Bat Area – Restricted**—These cave locations are extremely sensitive to disturbance from development, training activities, and noise, especially during the spring and fall migration periods. Disturbance of bats during hibernation can cause bat mortality. FLW would not conduct development activities in the 20-acres area surrounding these caves. Caves are off-limits for military operations. The DPW, Environmental Division (DPW-E), in consultation with the USFWS must approve any activities within 20 miles of the cave.
- **Bat Management Zone 1**—Bat Management Zone 1 is an area between a 162- and 457-meter radius of the cave (approximately 160 acres). The following guidelines are in place for Bat Management Zone 1:
 - No bivouac operations are permitted.
 - No chlorobenzylidene malononitrile, or tear gas, pyrotechnics, noise simulators, or smoke is permitted during the following periods from 1 hour before sunset to 1 hour after sunrise from:
 - 15 March to 31 May and 1 August to 15 October (Brooks, Davis No. 2, Joy, and Wolf Den Caves)
 - 1 April to 31 October (Freeman and Saltpeter #3 Caves).
- **Bat Management Zone 2**—Bat Management Zone 2 is an area between a 457- and 1,932-meter radius of the cave. The following guidelines are in place for Bat Management Zone 2:
 - All disruptive activities should be given a low priority or restricted, especially during the spring and fall.
 - The DPW-E must approve any training activity which results in the loss of tree canopy.
 - Development of training facilities and sites should be given a low priority.

Gray Bat

The gray bat was listed as endangered in 1976. Gray bats occur throughout most of southern Missouri and the population of gray bats in this area is “stable or increasing” (USFWS 1983). Although gray bats are known to use habitat along Roubidoux Creek and its tributaries, as well as other areas on FLW, no designated critical habitat for this species occurs on FLW. The gray bats that summer on FLW are thought to hibernate outside FLW during the winter in Coffin Cave in Laclede County, but small numbers of gray bats have been found in caves on FLW during the winter (FLW 2007). Gray bats use caves at FLW as

well as three caves near the Installation. One cave (Saltpeter No. 3 supports gray bats during the maternity season) (FLW 2007). Freeman, Joy, and Davis No. 2 caves are considered transient caves (FLW 2007). Studies conducted for the BRAC BA (USACE 1996b) indicate that gray bats use Freeman Cave during all seasons, except winter. Small numbers of gray bats use Davis No. 2 and Joy caves (FLW 2007), and Great Spirit Cave, 3.5 kilometers west of FLW, is known to support more than 10,000 gray bats, making it one of the more important maternity caves in Missouri. Surveys in 1994 estimate the presence of approximately 7,500 gray bats in maternity caves on FLW.

Northern Long-eared Bat

The northern long-eared bat was listed as threatened in early 2015 because of dramatic population declines, primarily resulting from the emergence of white-nose syndrome. This medium-sized bat has a wing span of 9 to 10 inches and is characterized by its medium to dark brown fur and its long ears. Northern long-eared bats are considered to be rare residents to FLW and because of the recent listing of this species and difficulty of detection, the degree to which the northern long-eared bat inhabits FLW is not well documented. Northern long-eared bat range spans much of the eastern and north-central United States, including Missouri and all of the Canadian provinces from the Atlantic Coast to eastern British Columbia. During the winter, northern long eared bats hibernate in various-sized caves or mines with high humidity, constant temperatures, and no air currents. Northern long-eared bats spend the summer months roosting either singly or in colonies in crevices or cavities underneath the bark of living and dead trees. Although breeding occurs in late summer or early fall, northern long-eared bats reproduce using delayed fertilization, so females do not give birth until the summer after moving to summer roosting sites. At dusk, northern long-eared bats emerge to feed on moths, flies, leafhoppers caddisflies, and beetles while in flight by means of echolocation (USFWS 2015). Northern long-eared bats roost in trees that are at least 3 to 5 inches in diameter especially when in riparian areas. It is possible that large trees in the riparian areas on FLW would be suitable roosting sites.

Although white-nose syndrome is the primary threat to northern long-eared bats, other sources of mortality, such as impacts to hibernation habitat or hibernacula, loss of summer habitat, or wind farm operations, may now be more important given the widespread impact of white-nose syndrome (USFWS 2015).

Spectaclecase Mussel

The USFWS listed the spectaclecase mussel, a freshwater mussel, as endangered in 2011 because of population decline and species fragmentation as a result of the construction and operation of dams, sedimentation, pollution, channelization, and nonnative species. The spectaclecase can grow up to

9 inches in length. Its shell is elongated, sometimes curved, and somewhat inflated. Historically, the spectaclecase was found in at least 44 streams of the Mississippi, Ohio, and Missouri River Basins in 14 states. It has been extirpated from 3 states and today is found in only 20 streams. The spectaclecase's current range includes Alabama, Arkansas, Illinois, Iowa, Kentucky, Minnesota, Missouri, Tennessee, Virginia, West Virginia, and Wisconsin. With few exceptions, spectaclecase populations are fragmented and restricted to short stream reaches (USFWS 2012a). At FLW, the spectaclecase mussel has sighted in the Big Piney River, and it has been found during surveys in multiple locations on the Big Piney River, both on and off FLW, by the MDC in 1994 and 2005 and by FLW natural resource staff in 2012 (FLW 2014a).

Bald Eagle

The bald eagle was listed as endangered in 1978. Population increases prompted down listing in 1995 to threatened. Further increases in bald eagle populations between 1995 and 1999 resulted in President Clinton proposing the bald eagle for delisting on July 4, 1999. The bald eagle was removed from the federal list of threatened and endangered species in August 2007. No designated critical habitat for the bald eagle occurs on FLW.

Prior to 2001, bald eagles were only known to occur on FLW during winter (November through March) when they were observed perching in large trees along Roubidoux Creek and Big Piney River. One active nest was located on FLW along the Big Piney River, downstream from Happy Hollow Beach. The MDC flyover survey conducted in May 2001 resulted in no sign of eggs or young in the nest. In March 2002, adult eagles were observed in the nest tree, but no other activity was observed that year. In 2003, eagles were observed near the nest tree, but no other activity was observed. The nest was active in 2004 and fledged two young (FLW 2007). Both juveniles were observed with an adult as late as August. The nest site will continue to be monitored by FLW in the future. Spatial and temporal restrictions were placed on human activity near the nest site after consultation with the MDC and USFWS. Signs and barricade cables have been established up to 400 meters from the nest to restrict human disturbance from 1 January through 30 June. The 2007 Endangered Species Management Plan for FLW describes management for maintenance/enhancement of habitat for bald eagles on the Installation (FLW 2007). FLW has instituted the following conservation measures:

- Establish a seasonal bald eagle nest protection zone around the existing nest site extending up to 400 meters, where activities that have potential to disturb nesting eagles are restricted from 1 January through 30 June. Human entry is prohibited unless performed in connection with necessary eagle research and management by qualified personnel.

- Close all trails with concrete barriers or steel cables to restrict vehicular access in the seasonal bald eagle nest protection zone from 1 January through 30 June.
- Post prohibitive signs and additional signs along the perimeter of the seasonal bald eagle nest protection zone.
- Prohibit hiking, hunting, or other recreational activities by foot or vehicle in the established seasonal bald eagle nest protection zone, not including floating on or fishing in the Big Piney River from a boat.
- Prohibit all military training activities within the established seasonal bald eagle nest protection zone from 1 January through 30 June, including all foot and vehicular traffic; chlorobenzylidene malononitrile, or tear, gas; smoke; pyrotechnics; and demolition simulators.
- Prohibit all natural resource management activities within the established seasonal bald eagle nest protection zones from 1 January through 30 June, unless these activities are performed by qualified personnel in connection with necessary eagle research and management.
- Reduce the potential of removing unknown communal night roosts by surveying for new night roosts every 5 years.
- Discourage continuous and/or repeated human disturbance (from 15 November through 15 March) where wintering eagles are known to have communal night roosts or form daily congregations (as defined in FWS 1983) on all lands or waters managed by FLW.
- Use appropriate smoke management techniques to minimize potential impacts of smoke inversion to occupied communal night roosts, daytime concentrations, and occupied breeding territories.
- In association with the predicted removal of the species from the list of threatened and endangered wildlife, assist the USFWS and the MDC with monitoring the status of the species on FLW up to 5 years following delisting according to the requirements outlined in the Endangered Species Act.
- No cutting sycamore trees > 45.7 centimeters diameter at breast height along Big Piney River or Roubidoux Creek.
- No burning within 0.25 air mile of Big Piney River between 1 January and 30 June.

FLW has established conservation goals in the 2007 Endangered Species Management Plan to provide habitat to maintain or increase current population levels and protect the species from adverse impacts

resulting from the Installation's mission (FLW 2007). These conservation goals are compatible with conservation goals for Indiana bats and gray bats at FLW. Within the Installation boundary, FLW will:

- Maintain/improve existing foraging habitat for wintering and summering (nesting) bald eagles
- Maintain/improve existing perching habitat for wintering bald eagles
- Maintain/improve existing roosting habitat for wintering bald eagles
- Maintain/improve existing nesting habitat for bald eagles
- Monitor populations of bald eagles on the Installation.

Bald eagles currently use riparian areas along Roubidoux Creek and Big Piney River for perching, nesting, and foraging. No night roosts have been identified on the Installation. Available perch sites, nest sites, and food sources limit the maximum potential wintering and nesting populations of bald eagles on FLW. Actual population size may remain below the theoretical maximum population size because of sub-optimal habitat, human disturbance, and potential effects of exposure to harmful chemicals (FLW 2007). Threats to this species on the Installation include loss of perch sites along Roubidoux Creek and the Big Piney River, disturbance from human activity near perch or nesting site(s), and potential exposure to unsafe concentrations of chemicals from military training.

Limited information is available regarding managing wintering eagles and their habitat. Winter management guidelines on FLW focus on conducting population surveys, maintaining habitat quality, and limiting disturbance at sites frequented by eagles. FLW, the USFWS, and the MDC conduct a census in Pulaski County (including the Installation) each winter. Surveys are conducted during midmorning hours (1000–1200) when eagles are foraging or perched away from night roosts. No surveys to determine locations of night roosts have been conducted on the Installation (FLW 2007).

Biological Assessment

To ensure compliance with Section 7 of the Endangered Species Act and in coordination with the Columbia Field Office of the USFWS, a BA was completed in 1996 to assess effects of the ongoing mission at FLW (USACE 1996b). The BA concluded that continuation of existing actions at FLW might affect Indiana bats, gray bats, and bald eagles. The USFWS issued a BO of the Master Plan and Ongoing Mission at FLW (USFWS 1996). Reasonable and prudent measures were formulated to avert impacts to threatened and endangered species. FLW has completed required monitoring studies and is preparing a summary report. Subsequent to its review, FLW and the USFWS will determine further monitoring requirements in support of ongoing mission activities.

As part of an extensive coordination effort associated with the 1995 BRAC relocation of the U.S. Army Military Police School and U.S. Army Chemical School, the Installation and the USFWS completed consultations associated with the Proposed Actions and potential reasonable and prudent measures that could be implemented by the Installation to ensure compliance with the intent and requirements of the Endangered Species Act. A BO was issued as a result of this coordination effort and the Installation is currently using the information contained in that BO to guide its management programs (USFWS 1997).

Management Practices to Ensure Compliance with the Biological Opinion at Fort Leonard Wood

Management practices used by FLW to ensure compliance with the BO are described in the INRMP. Included within the management practices that were implemented by the Installation was the establishment of restricted zones around caves and other natural features used by the threatened and endangered species. The western portion of the vehicle/tactical equipment maintenance facility potential relocation area in Training Area 220 intersects with a portion of Indiana Bat Management Zone 2. An unbroken forest canopy is an essential habitat requirement of these species. The DPW, Natural Resources, must approve any activity that results in the loss of tree canopy.

Table 3-4 lists the other species of state conservation concern that have a designated state status and that are known or likely to occur on FLW. Five species of mammals, twenty-six species of birds, four species of fish, six species of amphibians and reptiles, two plant species, five species of mussels, and one species of crustaceans are currently state-listed (FLW 2013).

Table 3-4. State Species of Conservation Concern That Occur or are Likely to Occur at Fort Leonard Wood

Common Name	Scientific Name	Taxonomic Group	State Rank
Seminole bat	<i>Lasiurus seminolus</i>	Mammal	SA
Silver-haired bat	<i>Lasionycteris noctivagans</i>	Mammal	S3
Eastern small-footed myotis	<i>Myotis leibii</i>	Mammal	S2
Golden mouse	<i>Ochrotomys nuttalli</i>	Mammal	S3
Long-tailed weasel	<i>Mustela frenata</i>	Mammal	S3
Black-throated green warbler	<i>Setophaga virens</i>	Bird	SU
Chestnut-sided warbler	<i>Setophaga pensylvanica</i>	Bird	SU
Loggerhead shrike	<i>Lanius ludovicianus</i>	Bird	S2
Brown creeper	<i>Certhia americana</i>	Bird	SU
Great roadrunner	<i>Geococcyx californianus</i>	Bird	S3
Least flycatcher	<i>Empidonax minimus</i>	Bird	SU
Bachman's sparrow	<i>Peucaea aestivalis</i>	Bird	S1
Marsh wren	<i>Cistothorus palustris</i>	Bird	S3

Common Name	Scientific Name	Taxonomic Group	State Rank
Cerulean warbler	<i>Dendroica cerulea</i>	Bird	S2S3
Ruffed grouse	<i>Bonasa umbellus</i>	Bird	SU
Long-eared owl	<i>Asio otus</i>	Bird	SU
Black vulture	<i>Coragyps atratus</i>	Bird	S3
Sandhill crane	<i>Grus canadensis</i>	Bird	S1
American bittern	<i>Botaurus lentiginosus</i>	Bird	S1
Snowy egret	<i>Egretta thula</i>	Bird	S1
Great egret	<i>Ardea alba</i>	Bird	S3
Virginia rail	<i>Rallus limicola</i>	Bird	S2
Sora rail	<i>Porzana carolina</i>	Bird	S2
Black-crowned night heron	<i>Nycticorax</i>	Bird	S3
Little blue heron	<i>Egretta caerulea</i>	Bird	S3
Great blue heron ^a	<i>Ardea herodias</i>	Bird	NA
Osprey	<i>Pandion haliaetus</i>	Bird	S2
Northern harrier	<i>Circus cyaneus</i>	Bird	S2
Sharp-shinned hawk	<i>Accipiter striatus</i>	Bird	S2
Swainson's hawk	<i>Buteo swainsoni</i>	Bird	S2
Bald eagle	<i>Haliaeetus leucocephalus</i>	Bird	S3
Blacknose shiner	<i>Notropis heterolepis</i>	Fish	S2
Bluestripe darter	<i>Percina cymatotaenia</i>	Fish	S2
Highfin carpsucker	<i>Carpionodes velifer</i>	Fish	S2
Plains topminnow	<i>Fundulus sciadicus</i>	Fish	S3
Northern scarletsnake	<i>Cemophora coccinea copei</i>	Reptile	S2S3
Eastern hellbender	<i>Cryptobranchus alleganiensis</i>	Amphibian	S1
Ringed salamander	<i>Ambystoma annulatum</i>	Amphibian	S3
Grotto salamander	<i>Eurycea spelaea</i>	Amphibian	S2S3
Eastern tiger salamander	<i>Ambystoma tigrinum</i>	Amphibian	S3
Common mudpuppy	<i>Necturus maculosus</i>	Amphibian	SU
Narrowleaf rushfoil	<i>Crotonmichauxii</i>	Flowering plant	S1
White camas	<i>Zigadenus elegans</i>	Flowering plant	S2
Elktoe	<i>Alasmidonta marginata</i>	Mussel	S2
Northern brokeray	<i>Lampsilis brittsi</i>	Mussel	S3
Ouachita kidneyshell	<i>Ptychobranchus occidentalis</i>	Mussel	S3
Black sandshell	<i>Ligumia recta</i>	Mussel	S2
Spectaclecase	<i>Cumberlandia monodonta</i>	Mussel	S3
Hubricht's long-tailed amphipod	<i>Allocrangonyx hubrichti</i>	Crustacean	S3

Source: MNHP (2015), FLW (2013)

Notes: State Rank:

S1 – Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. (Typically 5 or fewer occurrences or very few remaining individuals.)

S2 – Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. (6 to 20 occurrences or few remaining individuals or acres.)

S3 – Rare and uncommon in the state. (21 to 100 occurrences.)

S4 – Widespread, abundant, and apparently secure in state with many occurrences, but the species is of long-term concern. (Usually more than 100 occurrences.)

S5 – Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under present conditions.

S#S# – Numeric range rank: A range between two of the ranks. Denotes range of uncertainty about the exact rarity of the element.

S? – Unranked: Species is not yet ranked in the state.

SU –Unrankable: Possibly in peril in the state, but status uncertain; need more information.

^a Rookeries are located on FLW.

3.3.2 Environmental Consequences

3.3.2.1 Alternative 1 – No Action

Under Alternative 1, the RPMP Update would not be implemented and FLW would continue to manage the Installation based on the Master Plan, and FLW would complete projects on an informal basis.

Biological resources as described in the Affected Environment section would remain unchanged because FLW anticipates that potential projects would be constructed in previously disturbed areas. FLW would not conduct activities with the potential to affect wildlife and sensitive species or their habitats. Therefore, Alternative 1 would not affect vegetation, wildlife, or sensitive species.

Overall, no impacts to biological resources are anticipated under Alternative 1.

3.3.2.2 Impacts Common to Both Action Alternatives

Implementation of the Transit Network Plan would include the construction and operation of a bus system for FLW and the potential construction and operation of a light rail system. The implementation of a cantonment-wide bus system would occur within an existing footprint; therefore, all resources within the footprint have been previously disturbed and no further impacts to biological resources are anticipated. FLW anticipates that the potential light rail system would follow existing bus lines, so impacts to potential habitat would be minimized as a result of previous habitat disturbance. Potential impacts to biological resources from the light rail system could occur during construction as a result of ground disturbance. Any impacts would likely be short term and less than significant based on previous disturbance. Future NEPA process and documents would be necessary prior to implementation of the potential light rail once feasibility has been determined.

Implementation of the Pedestrian and Bicycle Networks Plan would include the construction of sidewalks and bicycle paths. New sidewalk and bicycle path construction would result in short-term, less than significant impacts to biological resources through ground disturbance and construction activities because such activities would be relatively small in scale and would occur within an existing infrastructure footprint. Future NEPA process and documents would be necessary to evaluate impacts at a site-specific level; however, it is anticipated that any potential impacts would be less than significant.

The Green Infrastructure Plan may affect biological resources through construction and maintenance of roadways. These less than significant impacts would be the same as those described for the Transit Network Plan and Pedestrian and Bicycle Networks Plan. Overtime, the implementation of green infrastructure would encourage pedestrian and bicycle activity, while lessening the load on high-maintenance, man-made infrastructure, which may lower the frequency and intensity of construction activities, thus reducing potential, adverse impacts to biological resources.

Implementation of the Utilities Framework Plan would include potential use of river bottomland for oilseed crop production, potential power plant, and CHP plants. Converting river bottomland for oilseed crop production could affect species habitat availability, foraging habitat availability, or other species and vegetation through ground disturbance. Future NEPA process and documents would be necessary to implement and evaluate the use of river bottomland for oilseed crop production once sites have been identified; however, it is anticipated that based on the relatively small scale of affected habitat when compared to overall habitat availability, impacts would be less than significant. The construction of a power plant or CHP plants could have short-term or permanent impacts on biological resources, depending on the type and scale. Construction of the power plant and its operation could negatively affect wildlife, vegetation, and other biological resources as a result of habitat and vegetation removal or associated detrimental impacts to both vegetation and habitat from operation, with overall impacts being less than significant. A future tiered NEPA evaluation process will be undertaken if a power plant is to be constructed. The operation of wind turbines could potentially affect migratory birds and bats. Wind turbines can cause direct mortality of birds and bats through collision, mainly presumed to be with turbine blades. In addition, some research suggests that bat fatalities can result from rapid decompression resulting from sudden changes in pressure near the rapidly moving blade tip or other portions of the blade (Strickland et al. 2011). It has also been suggested that turbines may disrupt a bat's echolocation capability. Echoes from moving blades can have features that make them attractive to bats or may make it difficult for the bat to accurately detect and locate the blades (Long et al. 2010). Most studies of avian fatalities report less than or equal to three fatalities per megawatt per year (Strickland et al. 2011).

Impacts to birds and bats would be reduced by following the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* during installation and operation of wind energy facilities (USFWS 2012b).

The land within the ADP districts can be classified as significantly developed. Areas within the ADP districts that are developable are very close to existing infrastructure and associated footprints. The ADP districts are characterized by the everyday use by personnel and visitors on the Installation. It is likely those areas that are developable and those sites that are proposed for construction as short-term projects (listed in Table 2-4) within the ADP districts are not critical use areas for species or their habitats and have very little vegetative presence. As such, it is anticipated that impacts would be less than significant with the extent of impacts depending on the geographic location and scale of future development. Prior to development and upon more specific site selection, impacts would be evaluated in a future tiered NEPA process.

Overall, adverse impacts to biological resources from actions common to both alternatives are anticipated to be less than significant from construction-related ground disturbance and noise and construction of future facility footprints.

3.3.2.3 Alternative 2 – Spine Roadway Option

The Alternative 2, the Spine Roadway Option, may have less than significant, direct or indirect impacts to biological resources. Direct impacts would stem from ground disturbance or vegetation alteration along the proposed roadway route through the center of the Main Cantonment from construction. Indirect impacts could occur to vegetative resources and habitats adjacent to the route as a result of roadway use. Based on previous and ongoing disturbances in the area, it is not anticipated that additional disturbances associated with the Spine Roadway Option would result in significant impacts.

Overall, the Spine Roadway Option would result in less than significant, adverse impacts to biological resources.

3.3.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, could have less than significant, direct or indirect impacts to biological resources along the proposed transportation route. Impacts could occur as a result of ground and habitat disturbance or as a result of the alteration of vegetation through construction or increased traffic. The Loop Roadway Option and associated increased activity after completion could affect biological resources adjacent to Indiana and Nebraska Avenues.

Overall, the Loop Roadway Option would result in less than significant, adverse impacts to biological resources.

3.4 Cultural Resources

Cultural resources for federal agency planning and environmental review purposes are primarily those resources that qualify for listing in the National Register and those addressed by certain other laws protecting archeological sites and Native American properties. The National Historic Preservation Act of 1966 (NHPA), as amended, is the principal legislative authority for managing cultural resources.

Generally, section 106 of the NHPA, as amended, and as implemented in 36 CFR §800, requires all federal agencies to consider the effects of their actions on cultural resources listed and/or determined eligible for listing in the National Register. Such resources are also termed “historic properties.” Historic properties are defined as “a district, site, building, structure or object significant in American history, architecture, engineering, archeology or culture at the national, state, or local level.”

Moreover, the federal agency must afford the Advisory Council on Historic Preservation the opportunity to comment in the event that an undertaking will adversely affect a cultural resource that is eligible for or listed in the National Register and must consult with the State Historic Preservation Office and other interested parties to avoid, minimize, or mitigate adverse effects.

Eligibility for listing in the National Register is established according to the official criteria of evaluation (36 CFR §60.4) issued by the U.S. Department of the Interior. The criteria relate to the following:

- The quality of significance in American history, architecture, archeology, engineering, and culture present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
 - That are associated with events that have made a significant contribution to the broad patterns of our history; or
 - That are associated with the lives of persons significant in our past; or
 - That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
 - That has yielded, or may be likely to yield, information important in prehistory or history.

Other important laws and regulations designed to protect cultural resources follow:

- Native American Graves Protection and Repatriation Act of 1990
- American Indian Religious Freedom Act of 1978
- National Environmental Policy Act of 1969
- Archeological Resources Protection Act of 1979

3.4.1 Affected Environment

The ROI for cultural resources is the area within which an option to implement the Proposed Actions could potentially affect existing cultural resources. For the Proposed Actions, the ROI for cultural resources is defined as FLW.

3.4.1.1 Area of Potential Effect

According to the Section 106 regulations (36 CFR §800), an Area of Potential Effect (APE) is defined as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. In NEPA terms, the APE is the equivalent of the study area for cultural resources.

The APE for this project encompasses the entirety of the Main Cantonment, and cultural resources present within the Main Cantonment are identified in Figure 3-2. In addition, the APE could include areas outside the Main Cantonment and potentially outside the boundaries of FLW in the event that areas are needed for borrow pits and for clean topsoil for construction projects. Direct effects on cultural resources would be restricted to areas of ground disturbance (e.g., new road construction) and historic property locations immediately adjacent to ground-disturbance sites. Indirect effects, such as visual and auditory impacts, could occur throughout the Main Cantonment.

3.4.1.2 Prehistoric and Historic Background

FLW contains diverse cultural resources that include prehistoric Native American sites; historic sites including towns, farmsteads, churches, schools and cemeteries; World War II-era buildings, stonework, and features; and Cold War-era facilities and landscapes. Cultural resources at FLW are detailed within FLW's ICRMP, which encompasses all aspects of the Cultural Resources Management Program for compliance with historic preservation laws (FLW 2003a).

To date, no archaeological sites have been identified at FLW that date to the Paleo-Indian Period (11000–7800 B.C.). Several survey and testing projects completed since 1992 have produced archeological evidence that indicates that Native American habitation of FLW began during the Early Archaic Period (7800–6000 B.C.) and continued into the historic period (A.D. 1700). Archaeological sites associated with each period have been identified at FLW (FLW 2003a). Prehistoric resources are commonly found in caves, rock shelters, and alluvial settings and include habitation sites, camps, resource collection sites, lithic scatters, petroglyphs, and mortuary cairns. FLW has identified the most sensitive areas on the Installation for containing prehistoric cultural resources as large river bottoms and bluffs and a 500-meter zone in the uplands adjacent to Roubidoux Creek and the Big Piney River (FLW 2003a).

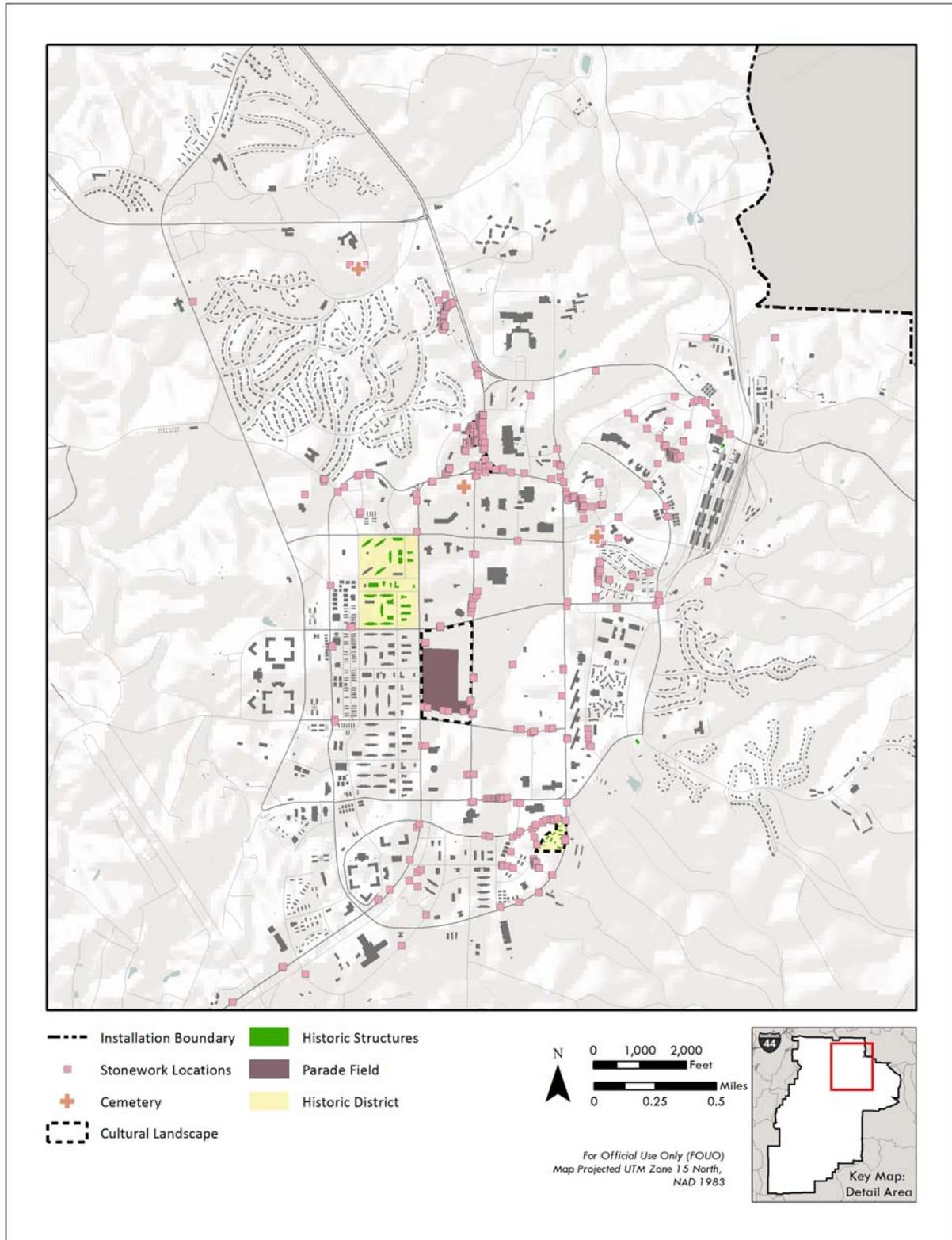


Figure 3-2. Cultural Resources at Fort Leonard Wood

Although the effects of the Europeans' arrival in North America likely began prior, it was not until the 1700s that explorers, trappers, and traders began to traverse the FLW region. The region remained sparsely settled until the early 1800s because of its isolation and lack of fertile farmland. During this time, the settlement of the Ozarks, particularly the outer fringes, increased as a result of increasing emigration into Missouri as a whole; however, the area was never densely occupied. Settlement increased again beginning in the 1830s, and two homestead acts—the Preemption Act of 1841 and the Graduation Act of 1854—further encouraged settlement. It is during this time that FLW began to be occupied (FLW 2003a). Farming became the dominant economy, most of it for subsistence purposes, and remained that way well into the late 1800s.

The region encompassing FLW remained isolated and sparsely inhabited until the start of the Civil War. The Civil War wreaked havoc on the region, leaving the area ruined and virtually unoccupied. Many of the people who left the area chose not to return or returned to destroyed homesteads and decided to move west. The habitation and economy of the area was revived and completely altered by the construction of the railway across the southern portion of the state. People returned to the area and continued to farm. In addition to farming, the expansion of the railroad led to the need for additional timber, and logging became an important part of the economy of southern Missouri (FLW 2003a; Tooker et al. 2007).

The Ozarks was never an ideal area for farming, and by the 1930s, poor farming practices had caused extensive soil erosion, making continued farming difficult. Lands adjacent to FLW were purchased by the federal government and restored by the Civilian Conservation Corps before becoming the Mark Twain National Forest (Tooker et al. 2007). With U.S. involvement in World War II looking more likely, the government purchased approximately 65,000 acres of land in the Ozarks for the construction of FLW. Design and construction of the Installation began in 1940, and it was occupied 7 months later (Tooker et al. 2007). A Landscape Plan for FLW was developed in 1941 to improve the Main Cantonment area after construction was complete.

In 1942, a prisoner of war (POW) camp was constructed in the southwest corner of the Main Cantonment to house up to 3,000 German and Italian prisoners (Tooker et al. 2007). As noted in the *FLW Cantonment Landscape Context, Inventory and Management* report (Tooker et al. 2007), “[t]hese POWs left an enduring impact on the landscape of FLW, building extensive stonework around the Main Cantonment. Between 1943 and 1945, more than 250 German prisoners built drainage structures, retaining walls, sidewalks and parks, some of which still exists today.”

FLW was deactivated in May 1947 and only minimally used until it was reactivated in August 1950 (Tooker et al. 2007). The minimal use during deactivation resulted in the need for major repairs and facility maintenance to allow for reuse. Shortly after reactivation, funding became available to replace

temporary World War II-era structures with permanent buildings; three phases of housing construction at FLW occurred between 1958 and 1963. In addition to personnel housing, other community buildings were constructed between 1958 and the 1970s (Tooker et al. 2007).

3.4.1.3 Cultural Resources Present at FLW

Archaeological sites, historic districts and structures, cultural landscapes, and cemeteries are all present within the Main Cantonment. These resources are summarized in the following text.

Archaeological Resources

As of 2006, 569 archaeological sites have been recorded across the Installation, including 358 prehistoric sites, 186 historic sites, and 25 sites that contain both prehistoric and historic artifacts (FLW 2016a). Of the 569 archaeological sites, 300 are considered or have been determined eligible for listing in the National Register. Prehistoric sites include caves, rock shelters, cairns, petroglyphs (rock art), open-aired bluff top alluvial base camps, and small lithic scatters (FLW 2014b). Historic sites include towns, churches, schools, farmsteads, and cemeteries (FLW 2014b).

At the time the ICRMP was drafted in 2003, 212 archaeological sites were classified as Considered Eligible for listing in the National Register. These sites need further testing to support National Register eligibility but are protected under the NHPA (FLW 2016a). An additional 269 archaeological sites have been determined not eligible for listing in the National Register; no further work is needed at these sites, and they are not protected under cultural resources laws.

The Main Cantonment is excluded from consideration for prehistoric archaeological sites because of the low probability of sites within this interior uplands location and because of the level of disturbances that occurred during the Installation's construction and decades of continuous building since its establishment.

Historic Districts and Structures

Four surveys were conducted within the Main Cantonment between 1987 and 2002 (FLW 2003a). These surveys documented all of the World War II-era historic structures and stonework present within the Main Cantonment. Forty-three historic buildings are located at FLW, most of which are contributing elements to two historic districts within in the Main Cantonment—the Rolling Pin Barracks Historic District and the World War II Temporary Building Historic District (FLW 2014b). The Rolling Pin Barracks Historic District is eligible for listing in the National Register and consists of 23 buildings and structures and 6 non-contributing buildings that contribute to the eligibility of the district (Tooker et al. 2007). An additional 12 historic buildings are contributing elements to the World War II Temporary Building Historic District (FLW 2014b). In addition to these districts, eight historic buildings are individually

eligible for listing in the National Register (FLW 2014b). Two other National Register-eligible historic buildings were documented in a 2003 survey, but they have since been demolished (FLW 2003b, 2016b).

In addition to historic buildings, numerous stonework structures within the Main Cantonment were constructed by POWs during World War II. An Installation-wide inventory of World War II-era stonework was completed in 2005; it recorded 253 National Register-eligible stonework locations. The stonework comprises three historic districts: the World War II Temporary Building Historic District and associated buildings, the German POW Stonework Historic District, and the German POW Fire Hydrant Plinth Historic District (FLW 2014b).

Cultural Landscapes

In 2007, FLW inventoried and evaluated the landscape features of the Main Cantonment to prepare its *Fort Leonard Wood Cantonment Landscape Context, Inventory and Management* report. The report documents the determination that the Main Cantonment as a whole does not retain enough integrity to be considered eligible for listing in the National Register; however, several areas within the Main Cantonment were determined eligible, including Veterans Park, the World War II Temporary Building Historic District, Gammon Field, and the old Post Headquarters/old Red Cross Building (Tooker et al. 2007).

Veterans Park is located on a triangular piece of land at the intersection of North Dakota Avenue and Missouri Avenue. The park was in existence before the POWs constructed the stonework, but the stonework within the park led to its current design. POWs began constructing the stonework in the park in 1945, and this elaborate stonework is considered some of the most important present on the Installation (Tooker et al. 2007).

The World War II Temporary Building Historic District landscape encompasses the location of the current Museum Complex. The area consists of 12 buildings, 11 of which are original to the World War II era. The site was originally laid out for the 182nd Field Artillery Regiment. It retains much of its original layout and is an example of the character of World War II layout and design. Additionally, it represents how the built environment at FLW is set within the rolling terrain (Tooker et al. 2007).

Gammon Field is approximately 11 acres and is located along Iowa Avenue in the southern half of the parade ground. It has served as the ceremonial center of FLW since 1954 and has changed little over the years (Tooker et al. 2007). The exceptions are the review stands and the metal bleachers as well as the pin oaks along Iowa Avenue.

The old Post Headquarters and old Red Cross Building were constructed in 1941. The 1941 *Landscape Development Report* described this area as the main entrance to the fort and called for it to be developed

with this in mind. Although several buildings were removed from this area in the 1960s, the old Post Headquarters and old Red Cross Building remain a focal point and tie back to the construction of FLW during World War II (Tooker et al. 2007). Although the landscape around these buildings has changed over the years, the buildings themselves and surrounding vegetation are in line with the World War II-era setting.

3.4.2 Environmental Consequences

This section presents a general discussion of the potential effects on cultural resources associated with the RPMP Update. Additional NEPA and NHPA compliance would be completed prior to the implementation of any of the Proposed Actions. The guidelines and protocols outlined in the *Fort Leonard Wood Integrated Cultural Resource Management Plan* (FLW 2003a) for compliance with Section 106 of the NHPA would be followed for all future actions. Site-specific impacts to cultural resources would be addressed and avoided, minimized, or mitigated at that time. It is important to note that impacts identified to cultural resources as a result of the Proposed Actions in this section do not serve as a NHPA determination; consequently, additional NHPA compliance would be completed prior to the implementation of the Proposed Actions.

As noted in the Affected Environment section, prehistoric archaeological resources within the Main Cantonment are excluded from consideration. This area is considered to have a low probability for the presence of these resources, and those that may be in the area have likely been extensively disturbed by earlier construction; therefore, the potential effects on prehistoric archaeological resources are not analyzed.

3.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, the RPMP Update would not be implemented and management of FLW facilities would continue based on the existing Master Plan with alterations to and constructions of facilities occurring on an informal basis. FLW would continue to address infrastructure issues as they arise. All activities with the potential to affect cultural resources would continue to be monitored and regulated through the use of existing agreements and/or preventative and minimization measures. Therefore, the No Action Alternative is anticipated to have less than significant impacts on cultural resources.

3.4.2.2 Impacts Common to Both Action Alternatives

The implementation of a cantonment-wide bus system under the Transit Network Plan is not anticipated to affect cultural resources because it would occur within an existing footprint and require no new ground disturbance. The bus system would run adjacent to the two historic districts and contributing elements of

the cultural landscapes. Additionally, numerous World War II stonework features are located along the proposed bus lines, particularly within the central part of the Main Cantonment; however, these routes are already in use by buses and other vehicles and the continuation of that use would not likely cause additional impacts. Beneficial impacts to historic districts and structures could occur from the implementation of the bus system if it results in a net reduction of vehicle traffic along these routes. A reduction in vehicle traffic would result in less wear and tear on historic structures adjacent to or within the roadways and would minimize indirect effects from vibrations and noise. The impacts associated with the cantonment-wide bus system are anticipated to be less than significant.

The implementation of a light rail system could adversely affect historic archaeological resources, historic districts and structures, and the cultural landscapes. The construction would involve extensive ground disturbance along the proposed routes, possibly affecting archaeological sites and requiring the removal of historic structures and World War II stonework features. Ground-disturbing activities associated with construction would result in short-term visual changes that could affect the cultural landscapes. Additionally, historic structures and the cultural landscapes may be affected if the routes are widened to accommodate vehicles and a light rail system, bringing traffic closer to these areas and increasing indirect effects from vibrations, noise, and visual intrusions. The impacts associated with the light rail system are expected to be less than significant. If significant impacts are identified through future planning, they would be mitigated to less than significant.

The implementation of the Pedestrian and Bicycle Networks Plan could lead to impacts to historic properties; however, overall, the impacts are anticipated to be less than significant due to the procedures in place for ensuring cultural resource review prior to implementation.

Impacts to historic properties would most likely occur in areas where ground disturbance is required to construct a trail or sidewalk or where it is necessary to widen an existing route to allow for multiple types of traffic. Construction of a Main Street connector across Gammon Field, an eligible cultural landscape, would adversely affect the field. This construction would alter the open nature of the field, one of the important aspects of this cultural landscape (Tooker et al. 2007).

The use of existing roads and trails by pedestrians or bicycles would have no effect on cultural resources. The infrastructure is already in place, and no new ground disturbance that could affect these resources would be conducted. Additionally, this type of use is consistent with the character of the historic districts and this cultural landscape.

Adverse impacts to historic properties could occur through the implementation of the Green Infrastructure Plan and ground-disturbing activities, such as the construction of storm water management areas.

Although the implementation of a 100-foot buffer for construction around riparian areas could result in some protection of archaeological resources, the removal of existing concrete features and return to a more natural setting could have negative impacts because of the higher potential for archaeological resources within these riparian areas. The implementation of the green streets concept has the potential to affect historic districts and structures and cultural landscapes, particularly if implemented within or adjacent to the resources themselves, if they introduce new visual elements that are not consistent with the character of the resources.

Although the Green Infrastructure Plan could negatively affect cultural resources, these impacts are anticipated to be less than significant because of the procedures in place for ensuring cultural resource review prior to implementation. FLW would follow the *Secretary of Interiors Standards for the Treatment of Historic Properties* when making any changes to historic properties.

Ground-disturbing activities and new construction associated with the Utilities Framework Plan have the potential to affect historic properties within the Main Cantonment. The implementation of biofuels production along river bottoms has the potential to negatively impact archaeological resources because of the higher potential for these resources to be present. Ground disturbance in other areas could potentially result in impacts to archaeological resources. Additionally, ground disturbance could affect the World War II stonework within the areas proposed for utilities development, except in the westernmost areas where stonework features are less common and could be easily avoided.

The Utilities Framework Plan could also impact both the Rolling Pin Barracks Historic District and the World War II Temporary Building Historic District. The CHP plant service area and ground source heat exchange are being considered within portions of these two districts. The construction of these utilities in these areas could have negative impacts on the historic districts by requiring modification of contributing buildings or structures or adding intrusive visual elements that are not consistent with the historic character. Development of the Utilities Framework Plan would result in few, if any, impacts to the cultural landscapes. With the exception of a portion of the cultural landscape centered on the World War II Temporary Building Historic District, eligible cultural landscapes are located outside the areas being proposed for development.

Overall, the impacts to historic properties are anticipated to be less than significant due to the procedures in place for ensuring cultural resource review prior to implementation. FLW would follow the *Secretary of Interior's Standards for the Treatment of Historic Properties* when making any changes to historic properties to ensure that historic properties are not adversely impacted, except in cases where the demolition of a historic structure is proposed.

The Area Development Plans were developed to focus planning efforts and guide land and facility developments that are similar in nature to specific districts. As such, Implementation of Area Development Plans is anticipated to have negative impacts on all cultural resources, particularly historic districts and structures and cultural landscapes. Ground disturbance has the potential to affect archaeological resources; therefore, potential impacts could occur with any demolition or new construction. In addition, short-term projects (listed in Table 2-4) have been designed to be consistent with the IDP and IDG and would have similar impacts to those identified for the ADP districts.

According to the Master Plan, the Rolling Pin Barracks, located in Area 2, BCT/OSUT, would be demolished to allow for the construction of a new BCT complex. Demolition of the Rolling Pin Barracks would negatively impact the historic district and would result in the loss of almost 50 percent of the remaining historic structures at the Installation. The demolition would also lead to the district no longer retaining its eligibility for listing in the National Register. The impacts, which would be significant but mitigable, would be mitigated under Section 106 of the NHPA.

In Area 4, AIT South, the construction of new buildings within the historic district has the potential to change the character and visual setting of the district, resulting in negative impacts to the integrity of the district. On the other hand, the removal of non-contributing or more recent structures that do not fit with the historic character of these districts could have beneficial impact on these areas.

Adverse impacts to World War II-era stonework could occur in all of the ADP districts, except Area 10, MSCoE, and Area 12, East Residences. The potential for impacts is most likely in Area 1, Downtown; Area 3, Central Recreation; Area 4, AIT South; Area 7, AIT East; Area 8, Nebraska UEPH; Area 9, Hospital; Area 11, Warehouse/Industrial; and Area 14, Community Zone; because of the number of World War II features present and the amount of construction and demolition being considered in those areas. World War II stonework may be affected directly by removing the features through demolition of buildings and/or by making room for new construction or indirectly by introducing construction in the vicinity of the features or increasing use of the features.

Contributing elements of the cultural landscapes are present in Areas 3, 4, 9, and 14, and FLW is considering new construction and demolition in these areas. These activities could have negative impacts on cultural landscapes by introducing new visual elements within or adjacent these areas. Negative impacts could be greatest within Area 3 where Gammon Field is located. Positioning new structures in proximity to this area would reduce the open feeling associated with the field and change the visual character of the landscape.

Overall, ADP district development would result in significant but mitigable impacts to cultural resources due to the removal of the Rolling Pin Barracks Historic District and potential alterations to eligible World War II stonework. Effects on cultural resources would be identified through the Section 106 review process prior to the implementation of any development projects, and adverse effects would be avoided, minimized or mitigated.

Impacts to cultural resources from actions common to both alternatives are anticipated to range from beneficial to significant but mitigable. Potential beneficial impacts would occur as a result of reduced vehicle traffic. Less than significant, adverse impacts could occur as a result of construction-related ground disturbance, road operation and facility demolition and construction. Significant but mitigable impacts would result from implementing the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District.

3.4.2.3 Alternative 2 – Spine Roadway Option

Under Alternative 2, the Spine Roadway Option, adverse impacts to historic archaeological sites, historic structures and the cultural landscapes could occur. Negative impacts to historic-era archaeological sites are possible in areas where new roadway construction is proposed or roads would be expanded or improved. Numerous World War II stonework features are located along the major roadway considered under this alternative. This route would be expanded and these features could be affected during construction. The Spine Roadway Option would run adjacent to a large cluster of World War II stonework features in the north-central part of the Main Cantonment. Additionally, the construction of the Spine Roadway Option adjacent to Gammon Field could lead to visual and auditory impacts on this cultural landscape. The larger roadway would be more visible from the parade grounds and allow for increased traffic, both privately owned vehicles and larger vehicles, leading to increased traffic noise at the parade ground.

Overall, the majority of impacts to cultural resources are anticipated to be less than significant due to the procedures in place for ensuring cultural resource review prior to implementation. However, the implementation of the Area Development Plans would result in significant but mitigable impacts to historic properties.

3.4.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, could negatively affect historic archaeological resources, the World War II Temporary Building Historic District, World War II-era stonework, and cultural landscapes. Negative impacts to historic archaeological site are possible in areas where new road construction would occur or where roads would be expanded or improved. The Loop Roadway Option

would run adjacent to the World War II Temporary Building Historic District. Although this road already exists, expanding it into a major roadway could directly affect the structures adjacent to the road.

Additionally, the increase in traffic along the road could have indirect effects on the historic districts by increasing noise, changing the views of and within the district, and increasing vibrations.

Numerous World War II stonework features are located along the major roadway proposed under this alternative. Most of these features are located along the eastern and southern portion of the loop. These features may be affected by the expansion of the roadway to accommodate it as a major arterial; however, this route would avoid a large cluster of World War II stonework features located in the north-central portion of the Main Cantonment, thereby providing some protection from road development and use.

The Loop Roadway Option would run adjacent to the World War II Temporary Building Historic District. Like Alternative 2, this alternative would affect the cultural landscape by changing the view of and within the landscape and increasing noise; however, the Loop Roadway Option would place the major roadway farther away from other cultural landscapes, providing these areas some protection from the visual and noise effects associated with traffic.

Overall, the majority impacts to cultural resources are anticipated to be less than significant because of the procedures in place for ensuring cultural resource review prior to implementation of the Proposed Actions. However, the implementation of the Area Development Plans would result in significant but mitigable impacts to historic properties.

3.5 Energy

Energy security is increasingly viewed as essential to ensuring and protecting the long-term viability of Installation operations. Safe and reliable access to energy is critical to virtually all activities on Army installations. The Army recognizes the threats to its installations and operations posed by increasing costs of centrally distributed, over-burdened, utility-provided energy grids, as well as the vulnerabilities posed by potential disruption of military installation energy supplies. Therefore, the Army has included energy as part of its Net Zero strategy.

The Army Net Zero approach comprises five interrelated steps: reduction, re-purpose, recycling and composting, energy recovery, and disposal. Each step is a link toward achieving Net Zero, as discussed in Section 1.7, *Related Plans and Environmental Documents*. Reduction includes maximizing energy efficiency in existing facilities. Re-purpose involves diverting energy to a secondary purpose with limited processes. For energy, recycling involves cogeneration where two forms of energy—heat and electricity—are created from one source. Energy recovery can occur from converting unusable waste to energy, renewable energy, or geothermal water sources.

Energy is divided into Installation-wide opportunities, district-level opportunities within the Main Cantonment, and strategies for individual facilities.

3.5.1 Affected Environment

The ROI for the energy analysis is limited to the proposed area of development within the boundaries of FLW as well as all applicable utility providers.

3.5.1.1 Electricity

SHO-ME Power Electric Cooperative supplies electrical power to FLW through a 69- kV transmission line, owned and maintained by Laclede Electric Cooperative. The line serves FLW through Substation 4, which serves as the main entrance to the Installation, which then further feeds Substations 1, 2, 3 and 5 where the primary distribution voltage is 12,470 volts for distribution.

Electricity accounts for 44.1 percent of energy use at FLW. This system supplies electricity to approximately 1,360 buildings, including 3 central energy plants. SHO-ME Power Electric Cooperative has a total generating capacity of 1,440,000-kV and has a current peak electricity usage within the SHO-ME service area is estimated to be approximately 50 percent (SHO-ME Power Electric Cooperative 2014). Within FLW, SHO-ME Power Electric Cooperative is nearing maximum capacity and is limited as a result of the single point of entry to the Installation.

3.5.1.2 Natural Gas

Omega Pipeline Company provides FLW with approximately 573 million cubic feet of natural gas per year, approximately 43 percent of the Installation's overall energy consumption. Omega Pipeline Company owns, operates, and maintains all distribution lines from the point of entry to the Installation up to and including the gas meters. FLW owns all gas infrastructures downstream of the meters, and a subcontractor provides maintenance.

The maximum gas supply available to FLW is estimated to be 14,000 million cubic feet per day. The current maximum peak demand for natural gas at FLW is 6,000 million cubic feet per day. With an estimated peak demand increase to 8,000 million cubic feet per day due to planned construction, the Installation has reliable capacity; however, because there is only one entry point, the Installation is susceptible to disruption of delivery.

3.5.2 Environmental Consequences

3.5.2.1 Alternative 1 – No Action

The No Action Alternative would not affect energy use or production because existing operations at FLW would persist. As such, less than significant to significant, adverse effects could occur, however, if the

cost and availability of fuel are prohibitive to the sustainability of the Installation as FLW operations persist. Without quantifiable projections, however, the range and extent of adverse impacts are unknown at this time. Having alternative fuel types and increased capacity for delivery of power as the Installment grows would ensure the continued viability of FLW and its objectives for the next 20 to 30 years.

Overall, no adverse impacts to energy are anticipated under Alternative 1.

3.5.2.2 Impacts Common to Both Action Alternatives

Direct and indirect impacts of implementation of the Transit Network Plan could have far-reaching effects on overall energy consumption and cost. The cantonment-wide bus system and the switch from diesel fuel to hybrid electric or natural gas could lower energy costs over the long term. Incorporation of light rail into the transit network also has the potential to cut energy consumption, subsequently cutting energy costs, because shared ridership can exponentially reduce overall personal fuel consumption. A benefit-cost analysis is required to prove extent of energy cost reduction, and a future tiered NEPA process would be implemented at the site-specific level; however, it is anticipated that long-term, beneficial impacts would occur. The Pedestrian and Bicycle Networks Plan could further reduce costs as more people opt out of fuel-based transit options for walking or biking to their desired destinations.

Providing greater than 70,000 linear feet of new sidewalks and nearly 60,000 linear feet of new trails as functional connectors throughout the Main Cantonment could substantially reduce energy consumption, thereby potentially resulting in multi-faceted, long-term, beneficial effects for the Installation by creating a multi-modal transportation environment and affording individuals viable travel alternatives.

The Green Infrastructure Plan would also encourage pedestrian and bicycle activity. It would simultaneously lessen the load on high-maintenance gray infrastructure, while beautifying the streets by which pedestrians and bicyclists travel, making the experience of travel and commuting using these new paths and green streets more enjoyable and interactive between people using them and the natural elements. Encouraging multi-modal, low-energy travel via green streets designed with the Green Infrastructure Plan could have various indirect, beneficial impacts on energy consumption.

The Utilities Framework Plan has the potential to affect energy consumption and costs in the most direct way of all the components of the IDP. The river bottomland could be used to produce oilseed crops as a biofuel alternative. A new potential power plant and CHP plants also are discussed in the Utilities Framework Plan. Ground source heat exchange also may supplement the heating and cooling of a building or buildings but is not expected to have Installation-wide impacts. Likewise, wind and solar power is not expected to be a viable Installation-wide energy source; however, evolving technologies may

allow integration of these technologies in the future. Impacts would be evaluated in a future tiered NEPA evaluation process; however, it is anticipated that implementation of the Utilities Framework Plan and any of the associated fuel and energy production components would have long-term, beneficial impacts on energy and would increase overall energy security at FLW.

FLW has more than 160 acres of potential sites for oilseed cropland in addition to possible road rights-of-way and other open spaces. All potential sites are currently outside the Main Cantonment, and fuel transport would be required along either of the two planned alternatives. Impacts from transportation from either of the alternative routes would result in less than significant impacts and the agricultural impacts would be similar to other crops, but a future tiered NEPA process would evaluate site-specific implications.

Growing demand for energy supply and the Installation's Net Zero energy goals necessitate the addition of more power-generating capability, possibly fueled by onsite biofuel production. Three potential power plant sites are all located outside the Main Cantonment. Transport of biofuel to the power plant would potentially use one of the Action Alternatives, with full evaluation of impacts occurring during a future tiered NEPA evaluation process, it is not anticipated that adverse impacts as a result of transport would be significant.

Five potential sites for CHP plants would provide an efficient method of delivery for heat and power to targeted redevelopment areas. Providing additional means of power delivery to these areas would improve the energy efficiency of FLW overall, resulting in overall beneficial impacts. Additional studies are needed to determine feasibility and impacts.

The Area Development Plan for the FORSCOM area (Area 5), encompasses the potential future substation in the southern portion of the Main Cantonment, and Area Development Plans for the BCT/OSUT (Area 2), hospital (Area 9), warehouse/industrial area (Area 11), and AIT South (Area 4), contain potential locations for CHP plants. The CHP plants can potentially serve several blocks within each of the ADP districts. The impacts of the energy delivery via these systems in their specific areas will be considered in a future tiered NEPA evaluation process; however it is anticipated that impacts would be long term and beneficial.

Implementation of the short-term projects and subsequent facility construction could result in additional loads on the existing energy system; however, based on the demolition of existing buildings to allow for the development of the proposed facilities and the use of sustainable design features and practices in newer buildings, it is not anticipated that FLW would experience noticeable, additional load requirements.

Furthermore, incorporating energy efficient facilities could eventually reduce loads on the existing system, resulting in long-term, beneficial impacts.

Overall, impacts to energy from actions common to both alternatives are anticipated to both beneficial and adverse, but less than significant. Beneficial impacts would occur as a result of increased renewable energy generation, energy security as well as from vehicle reductions and energy efficient facilities. Potential less than significant adverse impacts could result from increased transportation associated with oil seed cropland.

3.5.2.3 Alternative 2 – Spine Roadway Option

Alternative 2, the Spine Roadway Option, would have less than significant, direct impacts to energy. Indirect effects may include pedestrian activity along the roadway through the center of downtown (Area 1). This alternative would potentially have a negative impact on the vision of the 2013 Area Development Plan for downtown, for creating a more pedestrian-friendly atmosphere because this alternative would divide downtown in half. If people are not comfortable walking, they opt for vehicle travel, potentially increasing fuel consumption, thereby increasing energy demand specifically related to travel and resulting in long-term, less than significant impacts.

Overall, the Spine Roadway Option would result in less than significant, adverse impacts to energy.

3.5.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, would skirt downtown (Area 1) along Indiana and Nebraska Avenues, thereby diverting traffic away from the walkable center of the Main Cantonment and allowing for multi-modal transportation options. This alternative would have a less than significant impact on energy resources at FLW. Much of the east-west vehicular traffic along Minnesota is dissolved into the loop pattern rather than shunted directly to the center of downtown. The Loop Roadway Option also would provide direct access to the vehicular maintenance area, possible relocated motor pool near the airport, and down-range training areas, which require vehicular access and would create energy efficiency via programmatic adjacency.

Overall, the Loop Roadway Option would result in less than significant, adverse impacts to energy.

3.6 Facilities

The ROI for facilities is limited to the boundaries of FLW.

3.6.1 Affected Environment

The FLW real property inventory identifies almost 5,000 facilities on the Installation, including buildings, infrastructure and training areas. This number includes 1,009 permanent facilities built between 1940 and 2012. Figure 3-3 shows the number of permanent facilities by decade acquired.

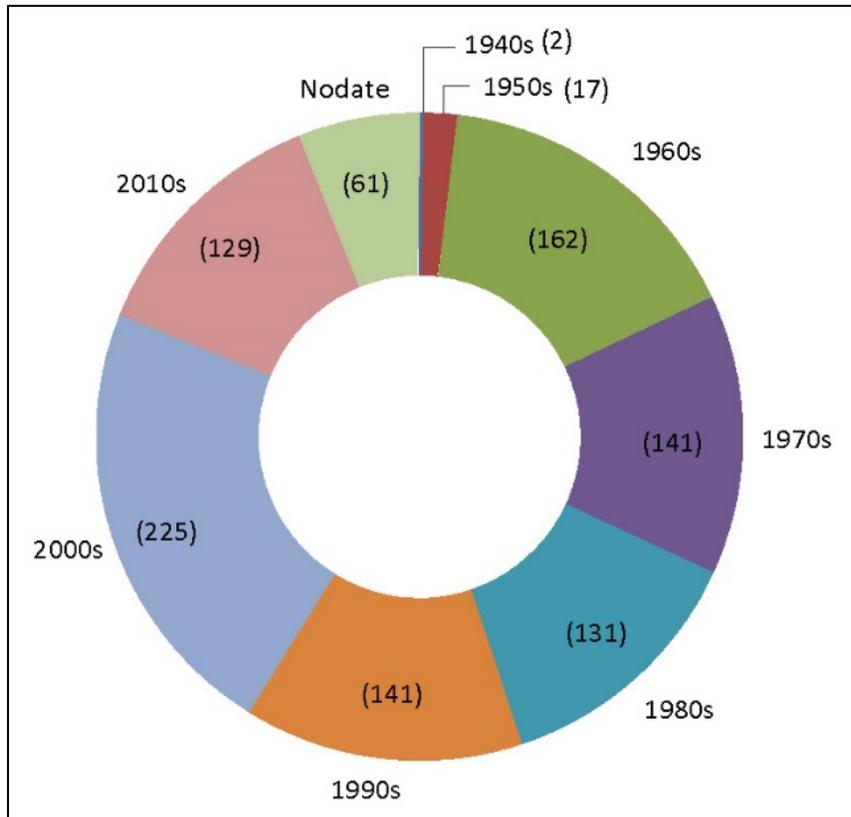


Figure 3-3. Number of Fort Leonard Wood Facilities by Decade

Approximately 1,300 facilities are rated in the Installation Status Report (ISR). The ISR measures Installation conditions against Army-wide standards in accordance to Army regulations, policy, and guidance. The rating systems in the ISR indicate where facilities and infrastructure are inadequate and may negatively affect the Army's overall mission. They are used to model and justify funding levels for the Installation. The ISR rates facilities for physical quality condition (Q-rating) and mission support functional capability (F-rating).

The ISR Q-rating determines the current quality of a facility. It is based on the relationship between the calculated “cost to fix” and the calculated facility Plant Replacement Value. AIT South (Area 4), and warehouse/industrial area (Area 11) have the most facilities that are rated as *poor* or *inadequate* in terms of Q-rating. Additional buildings in those areas are rated as *fair*. Some major community facilities, such as the post exchange, mini-mall, Building 470, and Truman Education Center, are rated as *fair* as well.

The F-rating is based on color ratings for rated facility components, adjusted by component mission weighting and component mission essential status. Fully mission capable buildings at FLW only account for half of those rated buildings. *Partially functional* and *reparably dysfunctional* buildings are spread across the Installation. Facilities rated as *irreparably dysfunctional* or *out of service* are generally concentrated in BCT/OSUT (Area 2) and AIT South (Area 4).

3.6.2 Environmental Consequences

3.6.2.1 Alternative 1 – No Action

Under the No Action Alternative, the RPMP Update would not be implemented and management of FLW facilities would continue based on the existing Master Plan. As such, the implementation of projects to address facility deficits and excesses would occur on an informal basis without an established framework used to allow for increased locational functionality of facilities. While addressing facility deficits would not conflict with any existing facility management or planning documents, other deficiencies and excesses would persist, resulting in long-term, less than significant, adverse impacts.

Overall, Alternative 1 would result in less than significant, adverse impacts to facilities.

3.6.2.2 Impacts Common to Both Action Alternatives

The implementation of the RPMP Update would provide direction, vision, and a framework for a long-term, orderly, and sustainable development and maintenance of FLW’s real property assets, including facilities. Components, including the Roadway Network Plan, Transit Network Plan, Pedestrian and Bicycle Networks Plan and Green Infrastructure Framework Plan, incorporate the use of vegetation and riparian buffers; efficient, naturalized drainage ways; traffic calming and efficiency measures; pedestrian-friendly connectivity; street landscape improvements; and other mechanisms to maintain the character of FLW, while increasing overall efficiency and safety for Soldiers, residents, and visitors. While not directly affecting existing or planned facilities, construction and operation of measures included in these plans would increase the overall efficiency and connectivity of FLW, thereby improving the overall character of the Installation and resulting in indirect, long-term, beneficial impacts from facility improvements. The establishment of naturalized and more efficient drainage ways could similarly result in the protection of facilities from possible water infiltration during severe weather.

The Utilities Framework Plan was developed to address infrastructure shortfalls, focusing on energy requirements at the Installation level, at the district level within the Main Cantonment, and for individual facilities. At the Installation-level, strategies include biofuels production and power generation via power plant. The application of these aspects would require construction of new facilities because no current facilities at FLW are appropriately located or meet facility requirements for these particular uses; therefore, no effects on existing facilities are anticipated. The establishment of secure energy sources, however, would provide greater energy independence for and security of existing and potential future facilities at FLW, resulting in long-term, beneficial impacts. Similarly, the development of a central energy framework, ground source heat exchange, and wind and solar energy, while not directly affecting existing facilities or their efficiencies, would provide a layer of energy independence and safety, resulting, in long-term, beneficial impacts.

The RPMP Update through the implementation of the ADP and the IDG would provide direction, vision, and a framework for long-term orderly, compact, and sustainable development of FLW, and as a result, all future facility projects under Alternatives 2 and 3 would be consistent with land-use designations and would minimize development in areas designated as restricted or limited to development due to presence of environmental, cultural, and/or operational constraints. The IDG's design and planning guidance would be implemented to achieve efficient, dense, compact, and clearly defined use of Installation lands that are consistent with the RPMP Update and would increase overall facility operational efficiencies, sustainability and connectivity, all of which would result in overall long-term, beneficial impacts.

The Capital Investment Strategy, which includes the implementation of actions necessary to address facility deficits and excesses, would result in long-term, beneficial impacts. Similarly, short-term projects identified to meet Installation and facility requirements would also result in long-term beneficial impacts.

Overall, impacts to facilities from actions common to both alternatives would be beneficial as a result of increased efficiencies, sustainability, connectivity, safety, and energy security as well as from addressing of facility deficits and excesses.

3.6.2.3 Alternative 2 – Spine Roadway Option

Implementation of Alternative 2, the Spine Roadway Option, would result in the features described previously as well as a major north-south transportation route. This roadway configuration would not affect existing facilities or proposed new facilities or land use plans. As a result, no impacts to facilities are anticipated.

Overall, no impacts to facilities are anticipated under Alternative 2.

3.6.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Implementation of Alternative 3, the Loop Roadway Option, would have the same impacts to facilities as those described for Alternative 2.

Overall, no impacts to facilities are anticipated under Alternative 3.

3.7 Geology and Soils

The ROI for the analysis of geology and soils includes the potential areas of development at FLW.

3.7.1 Affected Environment

FLW exhibits varying topography with sloping hillsides and geologic formations such as alluvial deposits and karst features, including caves in the immediate vicinity of the Main Cantonment. Soils vary with regard to their inherent capacity to accommodate development. Soils and geologic features of the Main Cantonment and surrounding areas are discussed in the following text.

3.7.1.1 Topography

FLW is located in the Springfield-Salem Plateau section of the Ozark Plateau division of the Interior Highlands physiographic province. The physiography of the Installation is characterized by forested hills whose valleys are formed by erosion from streams. Narrow and flat alluvia floodplains are bordered by sheer bluffs, rising upwards of 200 feet. Elevation varies from 758 feet above mean sea level in the riparian areas to 1,300 feet above mean sea level in the central upland portion of the Installation. Slopes within most of the Installation range from 0 to 15 percent, but slopes within the hilly terrain may reach 45 percent or greater. As illustrated in Figure 3-4, the Main Cantonment is primarily located on the relatively flat upland area. This area has level to gently rolling plains with slopes predominately less than 3 percent. Slopes south of the Main Cantonment range from 3 to 8 percent where surfaces are moderately dissected. Local relief within this area averages 15 feet.

3.7.1.2 Bedrock Geology and Geologic Formations

The bedrock at FLW comprises dolomites and sandstone from the Ordovician period. Depth to bedrock is 5 to 20 feet, but rock outcrops are common. Exposed dolomites in the region are highly susceptible to solution by groundwater. Waterways have a temporary storm flow character. Three near-vertically dipping faults (Countyline Fault, Nelson Creek Fault, and Hurd Hollow Fault) have been identified in the southwest portion of the Installation. Three types of geologic formations have been identified at the Installation—unconsolidated alluvial deposits, Karst features, and caves.

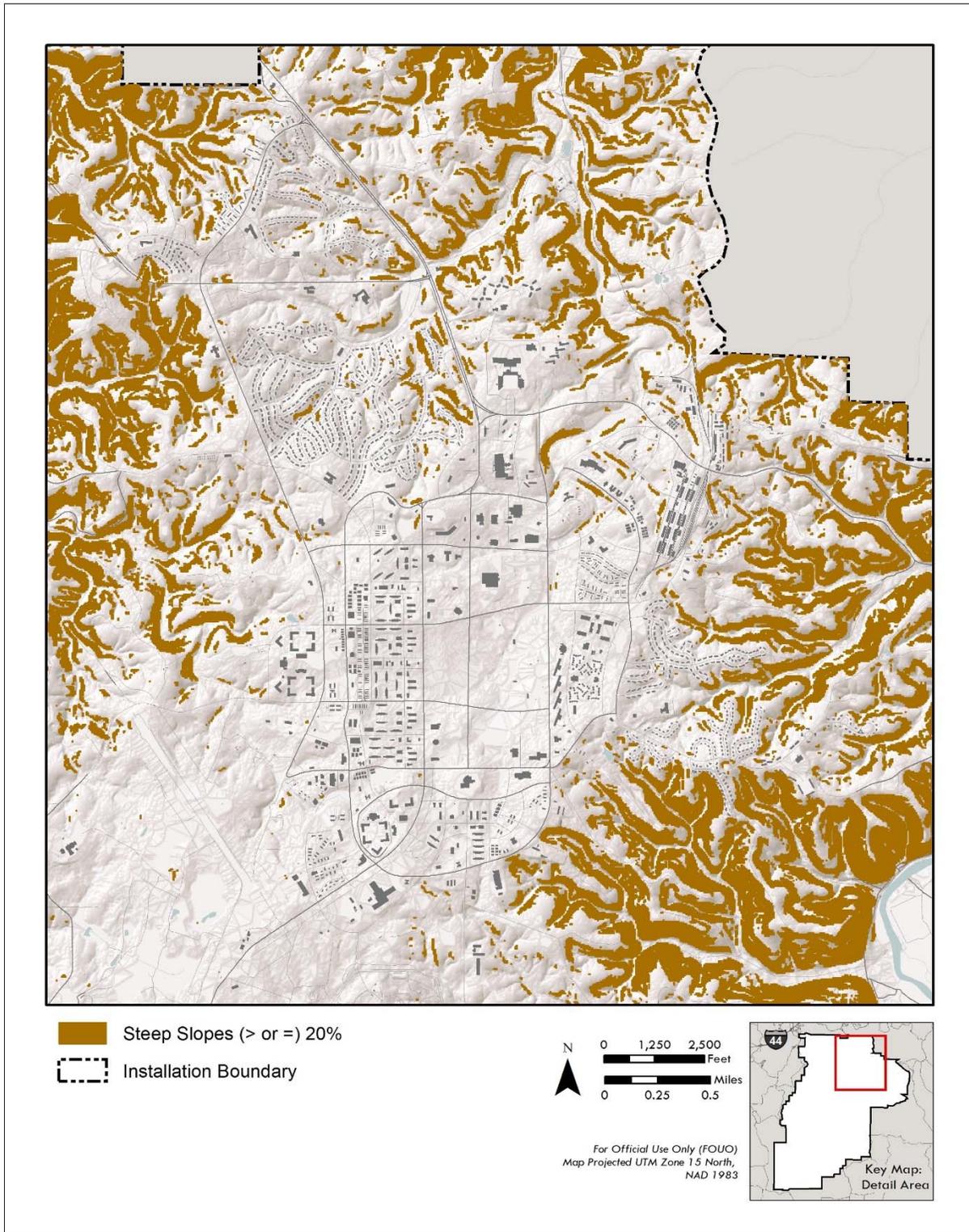


Figure 3-4. Slopes in Fort Leonard Wood's Main Cantonment and Vicinity

Unconsolidated alluvial deposits consisting of gravel, sand, and silt that occur on the floodplains of the Big Piney River and Roubidoux Creek are the youngest sediments on FLW. Stony, sandy, clay colluvial deposits that are closely associated with floodplain sediments are found in the channels of the major tributaries of the Roubidoux Creek and Big Piney River, and on the edge of the floodplains. These deposits exhibit generally poor foundation stability and are subject to occasional flooding. The Jefferson City Dolomite, the youngest of the three formations of Ordovician rocks exposed at FLW, occupies the higher elevations of the plateau and is common in the southern portions of the reservation. The lower portion consists of a massive, gray, finely crystalline bed of dolomite locally known as “cotton rock.”

The dolomites exposed in the region are highly susceptible to solution by groundwater. Karst features are evident throughout FLW but are most prevalent in the Main Cantonment and northern portion of the Installation. Karst features present at FLW, in addition to sinkholes, include large discharge springs, creeks that lose their flow, and caves. These features are most prevalent in the Main Cantonment and northern portion of the Installation.

Sixty-three caves were documented during a Cave Survey Project (FY 2002–2003) funded by the Legacy Resource Management Program. The closest cave to the Main Cantonment area is the Wolf Den Cave, which is approximately 0.75 mile to the southwest.

3.7.1.3 Soils

The soils at the Installation consist primarily of residual material formed on interbedded dolomite and sandstone, and a limited area of young alluvial deposits of sand, silt, gravel, and clay located along the floodplains of the Big Piney River and Roubidoux Creek. These soils are non-glacial in origin and formed from native bedrock. They have a thin loess deposit on the surface and stones in the hills and have low inherent fertility (especially low in phosphorus). Most soils on FLW are highly erodible, and disturbance from land development and active use (involving repetitive grading, compaction, and filling of soils used for heavy equipment training) has altered soils throughout the Installation. The Soil Conservation Service identified four general soil associations containing 41 distinct mapping units at FLW (Soil Conservation Service 1989). General soil associations are the Nolin-Huntington-Kickapoo, Clarksville-Gepp, Viration-Clarksville-Doniphan, and the Lebanon-Plato.

Each soil’s properties are assigned a numerical ranking as well as descriptive ranking of *very limited*, *somewhat limited*, or *not limited*. The following soil limitations on development can be used in conjunction with geo-technical site surveys to more exactly determine soil condition.

- *Very limited*—The soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.
- *Somewhat limited*—The soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design or installation. Fair performance and moderate maintenance can be expected.
- *Not limited*—The soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected.

Within the Main Cantonment, the dominant designation is *somewhat limited*. This ranking includes the Poynor silt loam, Urdothents, Union silt loam, and Viration silt loam soil groups. Common constraints for these soils include depth to saturated zone, shrink-swell, and slope. The stream valleys and their associated steep slopes are all categorized as *very limited* due to flooding, depth to bedrock, and steep slopes, in addition to the constraints for the *somewhat limited* soils. There is one small area of *not limited* soil in the southern end of the central Main Cantonment area.

Figure 3-5 shows the limitations for dwellings and small commercial buildings based on soil condition.

3.7.2 Environmental Consequences

3.7.2.1 Alternative 1 – No Action

Impacts to soils are expected to continue at their current levels under the No Action Alternative due to continuation of current land management practices. Development at FLW would continue on an informal basis in the absence of the RPMP Update and would occur as needed for particular purposes identified at the time, with no specific amount or extent of development determined. Both direct and indirect adverse impacts to soils would occur as a result of continuing construction activities at the Installation with adverse impacts to soils and geology being less than significant and short term in duration.

Implementation of the No Action Alternative would not result in substantial degradation of soils, soil fertility, soil productivity, or geologic resources. As a result, adverse impacts to soils would not be considered significant. Impacts to geology are not anticipated.

Overall, impacts to soils under Alternative 1 are expected to be adverse, but less than significant. Impacts to geology are not anticipated.

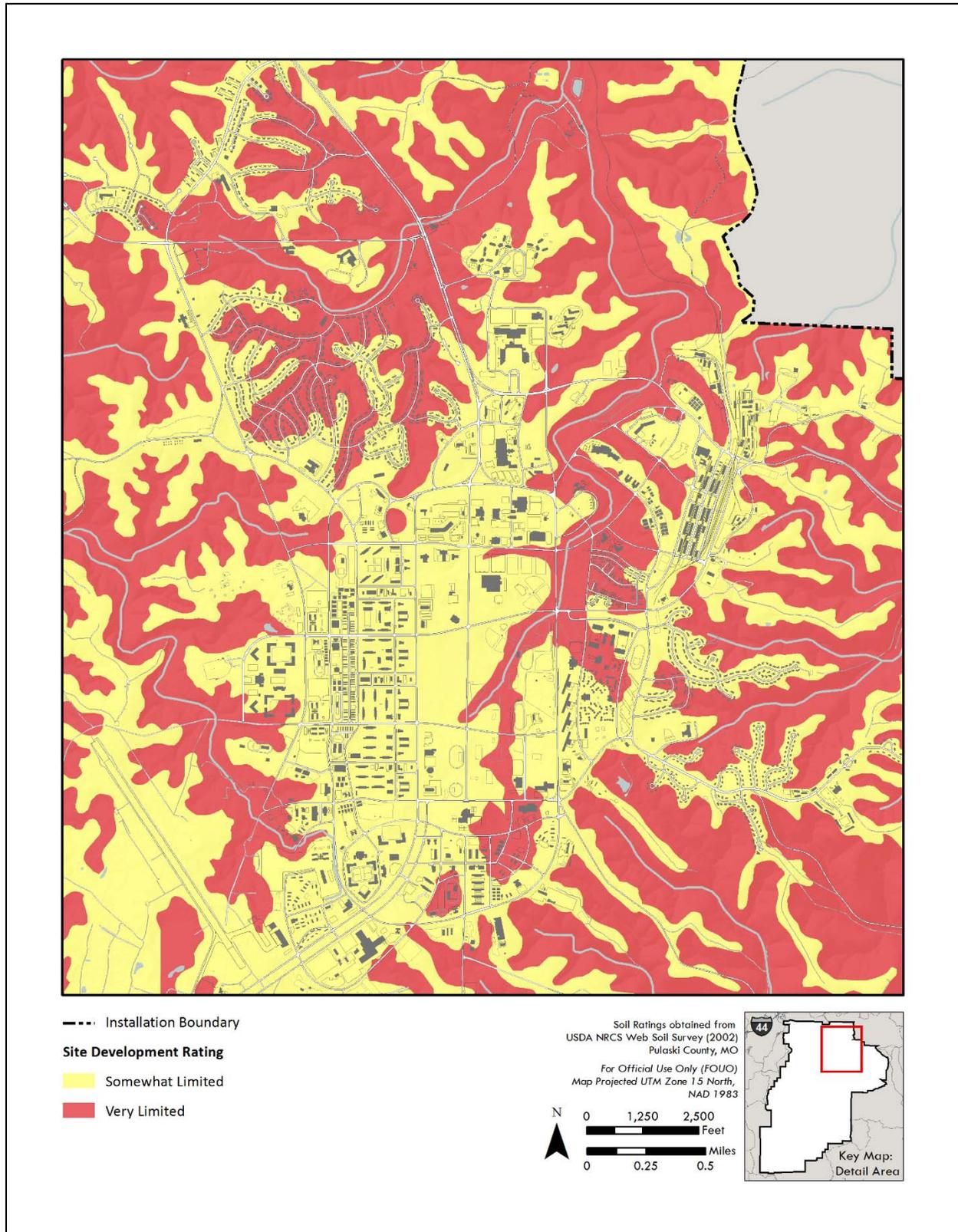


Figure 3-5. Site Development Rating of Soils within Fort Leonard Wood's Main Cantonment

3.7.2.2 Impacts Common to Both Action Alternatives

Neither Action Alternative would result in either short- or long-term impacts to geology. While grading, cut-and-fill, and other earth-moving activities would be associated with new construction, no sensitive geological features or geologic resources would be affected at the Installation.

Direct, short-term, adverse impacts to soils would occur under both Action Alternatives. Constructing new sidewalks and trails under the Pedestrian and Bicycle Networks Plan would disturb soils. Similarly, developing buildings and supporting infrastructure at 15 ADP districts throughout the Installation and through the identified short-term projects would result in short-term disturbances to soils over approximately 2,800 developable acres. Some of these impacts would be expected to occur on soils classified as *limited* or *very limited* for development. Adverse impacts would occur from grading, compaction, and site preparation activities, as well as from the removal of soils at the Installation from cut-and-fill activities related to construction. Based on previous disturbances and the relatively small amount of affected area compared to FLW as a whole, however, construction activities would not result in substantial degradation of soils, soil fertility, or soil productivity; therefore, it is anticipated that all adverse impacts would be less than significant.

Indirect, long-term, beneficial impacts to soils would occur from the removal of concrete channels and the widening of drainage area to naturalize the floodplain and plant native vegetation under the Green Infrastructure Plan. Soil productivity would be enhanced from deposition of alluvial material from streams. Long-term, beneficial impacts to soil productivity would also occur from implementation of the Green Infrastructure Plan.

Overall, impacts to soils as a result of actions common to both alternatives are expected to be beneficial and adverse, but less than significant. Beneficial impacts would occur as a result of the naturalization of floodplains and the planting of native vegetation. Less than significant adverse impacts to soils are anticipated as a result of ground disturbance. No impacts to geologic features are anticipated.

3.7.2.3 Alternative 2 – Spine Roadway Option

Under Alternative 2, the Spine Roadway Option, short-term impacts to soils and geology from construction would be the same as those described previously. Most impacts would occur at the center of the Main Cantonment under this option where much of the soil has been previously disturbed. Adverse impacts to soils would be less than significant.

Overall, impacts to soils under Alternative 2 are anticipated to be less than significant, resulting from ground disturbance. Impacts to geological features are not anticipated.

3.7.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Under Alternative 3, the Loop Roadway Option, effects on soils and geology would be the same as those described for Alternative 2.

Overall, impacts to soils under Alternative 3 are anticipated to be less than significant, resulting from ground disturbance. Impacts to geological features are not anticipated.

3.8 Hazardous Materials, Hazardous Waste, and Safety

The ROI for the analysis includes the potential areas of development and FLW in general as it relates to FLW's programs for handling hazardous materials and wastes.

3.8.1 Affected Environment

FLW maintains programs to minimize and prevent damage to the environment from the use of hazardous materials on the Installation. These programs include the Spill Prevention and Response Plan (IMCOM and FLW 2011) that identifies measures for preventing and responding to spills of petroleum, oils, and lubricants; hazardous materials; and hazardous wastes; the Hazardous Waste Management Plan with the objective of reducing quantity and toxicity of wastes generated at FLW; and a Pollution Prevention Plan with the goal of reducing the impacts of Installation operations on the environment. The Hazardous Waste Management Plan provides guidance and assigns responsibility for the safe and proper methods for handling, storing, and disposing hazardous wastes at FLW. FLW implements standard operating procedures that prevent or minimize the potential threat to human health and the environment from working with hazardous and toxic materials.

The following sections provide a brief description of the primary laws and regulations governing hazardous materials, toxic substances, and items of interest at FLW. In general, hazardous materials and waste and toxic substances issues are governed by such statutes as the Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), CAA, Clean Water Act (CWA), Safe Drinking Water Act, Federal Facilities Compliance Act, Military Munitions Rule, and federal Hazardous Materials Transportation Law. Army regulations and executive orders have also been established pursuant to these and subsequent federal and state regulations.

3.8.1.1 Hazardous Materials Use, Handling, and Storage

Hazardous materials are chemical substances that pose a substantial hazard to human health or the environment when improperly treated, handled, used, packaged, stored, transported, or disposed of. Hazardous materials are identified and regulated under the CERCLA, Occupational Safety and Health

Act, and Emergency Planning and Community Right-to-Know Act. Hazardous materials commonly used at military installations include solvents; antifreeze; and petroleum, oils, and lubricants; batteries; paint-related materials; aerosol cans; floor strippers; cleaning supplies; fluorescent lights; field sanitation kits; fuels; printer cartridges; and alcohols. Hazardous materials at FLW are stored in designated areas in appropriate containers. As mentioned previously, FLW has standard operating procedures that prevent or minimize the potential threat to human health and the environment from working with hazardous and toxic materials.

3.8.1.2 Hazardous Waste Generation, Storage, and Disposal

The RCRA and the Hazardous and Solid Waste Amendments of 1984 define hazardous waste as a solid waste or combination of wastes that due to its quantity, concentration, or physical or chemical characteristics may cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, or may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, disposed of, or otherwise managed. A solid waste is a hazardous waste if it is not excluded from regulation as a hazardous waste under 40 CFR §261.4(b) and if it exhibits identified characteristics of hazardous waste or meets other specified criteria. Hazardous wastes commonly generated at military installations include hazardous materials with an expired shelf life; paint and paint-contaminated media; fluid from change out processes, such as oil, batteries; fluorescent lights; field sanitation kits; waste from weapons cleaning; aerosol cans; used antifreeze; contaminated fuels; oily rags; and waste filters.

FLW is designated as a large-quantity hazardous waste generator and manages its hazardous waste in accordance with the RCRA, Missouri Hazardous Waste Management Law (Title 25 Code of State Regulations §§260–270), and Army regulations. As part of these management activities, specific locations/organizations on the Installation are allowed to accumulate waste onsite in secure locations within their area of operations that are designated and known as Satellite Accumulation Points. Personnel in charge of these accumulation areas are required to complete an online training course. Waste may be collected at these limited points of origin locations for a specified period or until a specified quantity of waste is collected. Once either the quantity of waste collected or the time frame allowed for onsite accumulation is reached, the Installation has a specifically trained contractor that collects the waste and transports it to the Installation's 90-day hazardous waste handling facility (FLW 2006).

3.8.1.3 Toxic Substances

The TSCA addresses those chemical substances and mixtures that may present unreasonable risk of personal injury or health of the environment from their manufacturing, processing, distribution, use, or

disposal. The TSCA Chemical Substances Inventory lists information about more than 62,000 chemicals and substances. Toxic substances typically include pesticides, asbestos, lead-based paint, radon, and PCBs.

Pesticides are substances or mixtures of substances, including biological control agents, that may prevent, destroy, repel, or mitigate pests or any substance or mixtures used as a plant regulator, defoliant, desiccant, disinfectant, or biocide and are specifically labeled for use by the USEPA. All pesticides are applied in strict accordance with the pesticide label. Pesticide use at FLW is typically relegated to landscaped areas.

Asbestos is a common constituent of building materials manufactured prior to 1978 when a federal ban on its use in building materials became effective. Asbestos-containing materials are any material containing more than 1 percent asbestos. Typically, asbestos is contained in plaster, acoustic ceiling tiles, wallboard, floor tiles/carpeting mastic, and roofing materials. Asbestos particles may also be present in building ductwork. In accordance with Section 112 of the CAA (40 CFR §61), the USEPA has classified asbestos-containing materials as a hazardous air pollutant. Installation-wide asbestos surveys were conducted at FLW in the 1980s (Duncan 2014). Asbestos-containing materials may be present in buildings or other facilities that would be modified or demolished as part of the Proposed Actions.

Lead-based paint may also be present in buildings or other facilities that would be modified or demolished under the Proposed Actions. Based on federal testing methodology, paint is considered hazardous if lead is detected at concentrations greater than 5 micrograms per liter. FLW samples for lead-based paint at the time of renovation or demolition (Duncan 2014).

FLW does not currently store any liquid PCBs on the Installation; however, liquid PCBs are present in some mechanical equipment, such as transformers, and likely are present at FLW. Non-liquid PCBs are known to exist in building materials, such as window caulking, and likely exist at FLW. Radon surveys have been conducted, but no sites having concentrations that would require remediation were identified (Duncan 2014).

3.8.1.4 Site Contamination

Potential hazardous waste contamination areas are investigated as part of the Defense Environmental Restoration Program (DERP). As part of this program, the DoD created the Installation Restoration Program and the Military Munitions Response Program. These programs were instituted to satisfy the requirements of the CERCLA and RCRA for former and current hazardous waste sites. The FLW Environmental Program follows a non-National Priorities List CERCLA process for its sites, consisting of one or more of the following steps: 1) site discovery, 2) preliminary assessment, 3) Remedial

Investigation /Feasibility Study, Proposed Plan, 4) decision document, 5) remedial design, and 6) remedial action/cleanup. As compared to the traditional CERCLA process, the non-National Priorities List CERCLA process can end at any one of the early steps with a decision document (IMCOM and FLW 2011).

FLW has several Installation Restoration Program sites within the Main Cantonment and associated land use control (LUC) areas, as discussed in the following text and shown on Figure 3-6. LUCs are physical, legal, and other mechanisms that restrict property use. They are used to mitigate risk associated with exposure to environmental contamination either during or following remedial action or cleanup, when it is inappropriate or infeasible to eliminate risk by removing or treating the contaminated media to unrestricted use levels. LUCs are maintained until the concentration of hazardous substances in soil and groundwater allows for unrestricted use and exposure.

- FLW-008, known as Landfill 6 or Rose Bowl Landfill, is located in the northeastern part of the Installation, northeast of the intersection of Minnesota Avenue and Gas Street. It occupies approximately 7 acres. Potential risk is uncertain because of the lack of subsurface soil samples within the fill boundaries. LUCs at FLW-008 preclude building, exception for installing storage units not used for human occupancy, conducting other invasive activities, and installing potable water supply wells in controlled areas.
- FLW-056, a former dry cleaner site, is approximately 1 acre and is located at the southeast corner of the intersection of 1st Street and Louisiana Avenue. Prior to the 1970s, the facility on site used trichloroethylene (or TCE) and tetrachloroethylene (or PCE) in dry cleaning solvents. The building was demolished in 1987 and the site is covered with grass now. LUCs at FLW-056 preclude unrestricted use of the site because of potential exposure to contaminants in groundwater and restrict development of residential and commercial buildings in areas where site-related contaminants have been measured in soil gas.
- FLW-035, Directorate of Engineering and Housing and Used Transformer Areas, is located in the east central part of the Main Cantonment, consisting of two separate locations. One area is a loading dock between Building 2221 and Building 2222, and the other area is a concrete pad behind Building 2224. Both locations had oil spills from transformers. The LUCs encompass the areas around each spill where PCB concentrations exceed threshold levels. The LUCs prohibit construction activity within the LUC footprint for unrestricted (residential) land use.

- FLW-037, former pesticide storage area, is located in the east central part of the Main Cantonment. It was formerly used for pesticide storage and mixing; later, it was paved and used as a parking lot. The LUCs encompass locations where pesticide concentrations exceed screening levels and surrounding areas. The LUCs prohibit residential reuse and land use scenarios that potentially create extended exposure to children.
- FLW-006, Landfill 4 (Ballfield/Running Trail), is a 9.3-acre landfill site that is located in the north-central part of the Installation within the Main Cantonment, northeast of the intersection of Constitution and Kansas Avenues. A dog park (formerly a baseball field) exists on the southeastern corner of FLW-006. Current site users at FLW-006 include joggers and people involved in baseball activities, groundskeepers, and the occasional utility worker (for sewer line maintenance). LUCs at FLW-006 preclude building, except for installing storage units not used for human occupancy, conducting other invasive activities, and installing potable water supply wells in controlled areas.

3.8.1.5 Storage Tanks

FLW has numerous underground storage tanks and aboveground storage tank, as shown in Figure 3-7. Most storage tanks are located at the edge of BCT/OSUT (Area 2), AIT South (Area 4), and the industrial area (AREA 11). The storage tanks range in size and contain substances such as diesel, used oil, and fuel (FLW 2014b).

3.8.2 Environmental Consequences

This section discusses the effects that Proposed Actions could have on public health or welfare and the environment from existing hazardous materials and waste. It also discusses possible effects from the introduction of new hazardous substances (i.e., construction materials) under the Proposed Actions. Environmental effects would be significant if they present a danger to public health or welfare or the environment.

3.8.2.1 Alternative 1 – No Action

Underground storage tanks, lead-based paint, pesticides, petroleum, oils and lubricants (POLs), and asbestos are the primary hazardous materials and toxic substances found at FLW. Under Alternative 1, the implementation of projects to address facility deficits and excesses would occur on an informal basis, and as these project come up, FLW would conduct surveys for the presence of PCBs, asbestos, and/or lead paint, as specified by current FLW procedures. If asbestos and lead-based paint are found, FLW would implement abatement tasks to proceed with redevelopment activities. As a result, Alternative 1 would have a long-term, beneficial effect by removing asbestos and/or lead paint.

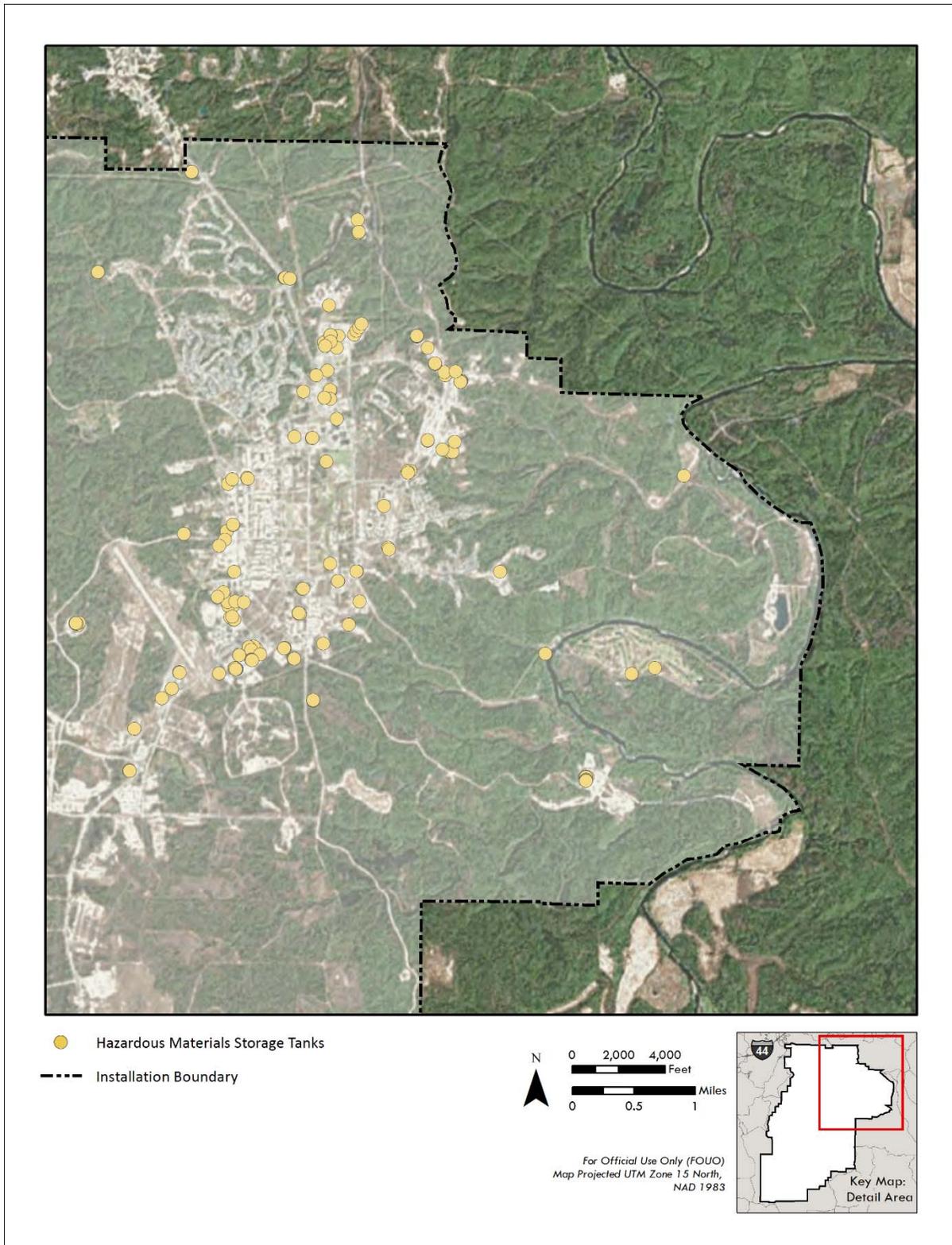


Figure 3-7. Fort Leonard Wood Storage Tanks

Any potential future new construction under Alternative 1 generally would not generate hazardous waste and would not introduce new sources of hazardous materials with the exception of storage and use of products necessary for construction activities. Adherence to applicable policies would minimize impacts from storage and use of POL products on the Installation, including those resulting from project construction, resulting in potential, less than significant impacts.

Under Alternative 1, FLW would recycle or reuse construction, renovation, and demolition waste to the fullest extent possible and would properly dispose of remaining waste. FLW would continue to use pesticides in landscaped areas as needed, but pesticide use would be regulated and pesticides would be stored according to applicable policies and regulations, resulting in no impacts.

Overall, impacts to safety from hazardous materials and hazardous waste under Alternative 1 are anticipated to be both beneficial to human health and safety and adverse, but less than significant, from the potential of petroleum leaks from construction equipment.

3.8.2.2 Impacts Common to Both Action Alternatives

The RPMP Update through the use of Area Develop Plans would consolidate similar land use functions, particularly industrial land uses and training, all of which would ultimately allow more efficient program management and tracking of storage and use of hazardous materials on the Installation. In general, the effects from construction and demolition activities under Alternatives 2 and 3 would be similar to those as described for Alternative 1 and would continue to occur under the RPMP Update.

As stated for Alternative 1, new construction, including construction from short-term projects, would not generate hazardous materials and would not introduce new sources of hazardous materials with the exception of storage and use of products necessary for construction activities. FLW would recycle or reuse construction, renovation, and demolition waste to the fullest extent possible and would then properly dispose of remaining waste. FLW would minimize impacts from storage of petroleum products on the Installation, including those resulting from project construction, by complying with applicable policies and regulations. Overall impacts to public health or welfare and the environment from existing hazardous materials and waste would be both short term and long term, adverse, and less than significant.

Elements common to both Alternatives 2 and 3 would result in continued, long-term, beneficial effects through the identification, removal, and remediation of hazardous substances, including contaminants in soil, asbestos, PCBs, and lead-based paint throughout FLW. Each future new construction, demolition, or redevelopment project that occurs as part of the implementation of the RPMP Update would generate solid waste from demolition, construction materials, and land clearing; however, as stated for

Alternative 1, FLW would recycle or reuse construction and demolition materials to the fullest extent possible and would properly dispose of remaining solid waste.

Overall, impacts to human health and safety from hazardous materials and hazardous waste under actions common to both alternatives are anticipated to be beneficial from the identification, removal, and remediation of hazardous substances and adverse, but less than significant, from the potential of petroleum leaks from construction equipment.

3.8.2.3 Alternative 2 – Spine Roadway Option

Implementation of Alternative 2, the Spine Roadway Option, would result in the features previously described as well as construction of a major north-south transportation route. This roadway configuration would entail construction and demolition activities resulting in less than significant, short- and long-term impacts on human health and safety from hazardous materials and hazardous waste, similar to those previously presented.

Overall, impacts to human health and safety from hazardous materials and hazardous waste generated during construction and demolition activities under Alternative 2 are anticipated to be adverse and less than significant.

3.8.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Implementation of Alternative 3, the Loop Roadway Option, would have the same impacts to human health and safety and the environment from hazardous materials waste as described for Alternative 2.

Overall, impacts to human health and safety from hazardous materials and hazardous waste generated during construction and demolition activities under Alternative 3 are anticipated to be adverse and less than significant.

3.9 Land Use

The ROI for the analysis includes the potential areas of development within the FLW boundaries.

3.9.1 Affected Environment

The Installation boundary currently encompasses approximately 63,000 acres and is divided into two primary functional areas—the Main Cantonment and non-cantonment areas. The Main Cantonment is approximately 10,000 acres and is classified as improved/developed grounds. The non-cantonment area encompasses the remaining 53,000 acres, and this area is primarily used to support the Installation's training functions (U.S. Army 2006).

Land use management and planning at FLW is centered around the existing RPMP, which guides the location of land uses based on compatibility to surrounding land uses and the military mission as well as natural, cultural and operational limitations and constraints. Land use constraints guiding development can be categorized as either *prohibitive* or *restrictive* based on the potential impact to land use.

Prohibitive constraints delineate areas where either existing features or regulatory factors would impose considerable hardship toward development or where development can negatively affect FLW's mission. It is possible to use these lands for development; however, the mitigation is likely to be intensive and costly. Prohibitive constraints include but are not limited to wetlands, floodplains, steep slopes, riparian zones, airfield zones, and land use control areas. Restrictive constraints denote areas with features that can be mitigated if affected; the majority of the central Main Cantonment is classified as containing restrictive constraints. Constraints include noise zones, historic districts, ammunition storage and aboveground and underground storage tanks.

Non-cantonment land use consists primarily of range and training activities. Training functions, activities, and exercises that are conducted within the non-cantonment areas include training on weapons demonstration and qualification ranges, training areas, bivouac sites, and maneuver areas. Together, these areas encompass approximately 90 percent of the land area of the Installation (U.S. Army 2006).

The Main Cantonment is the urbanized area of FLW and has been developed to include a number of different land uses that are necessary for a complete community. Land uses within the Main Cantonment include six categories: community, professional/institutional, troop, airfield, industrial, and residential. Figure 3-8 shows these areas as along with the range complex. Each land use type reflects the dominant land use within that area, not minor outliers to the primary use. For example, an industrial land use area may also contain administration, medical, community facilities, and supply and storage areas. Detailed descriptions of the six land use types within the Main Cantonment follow.

Community

The community land use category is composed of a mix of uses. Allowable uses include religious, Family support, personnel services, professional services, medical, community, housing, commercial, and recreational services. While the Pine Valley Golf Course is located southeast to the Main Cantonment, most community support facilities on the Installation are centrally located at the Main Cantonment within the area bounded by Nebraska Avenue on the east, Iowa Avenue on the west, South Dakota Avenue on the south, and North Dakota Avenue on the north. The community land use category has branches of varying sizes extending to the north, northeast, and southeast.

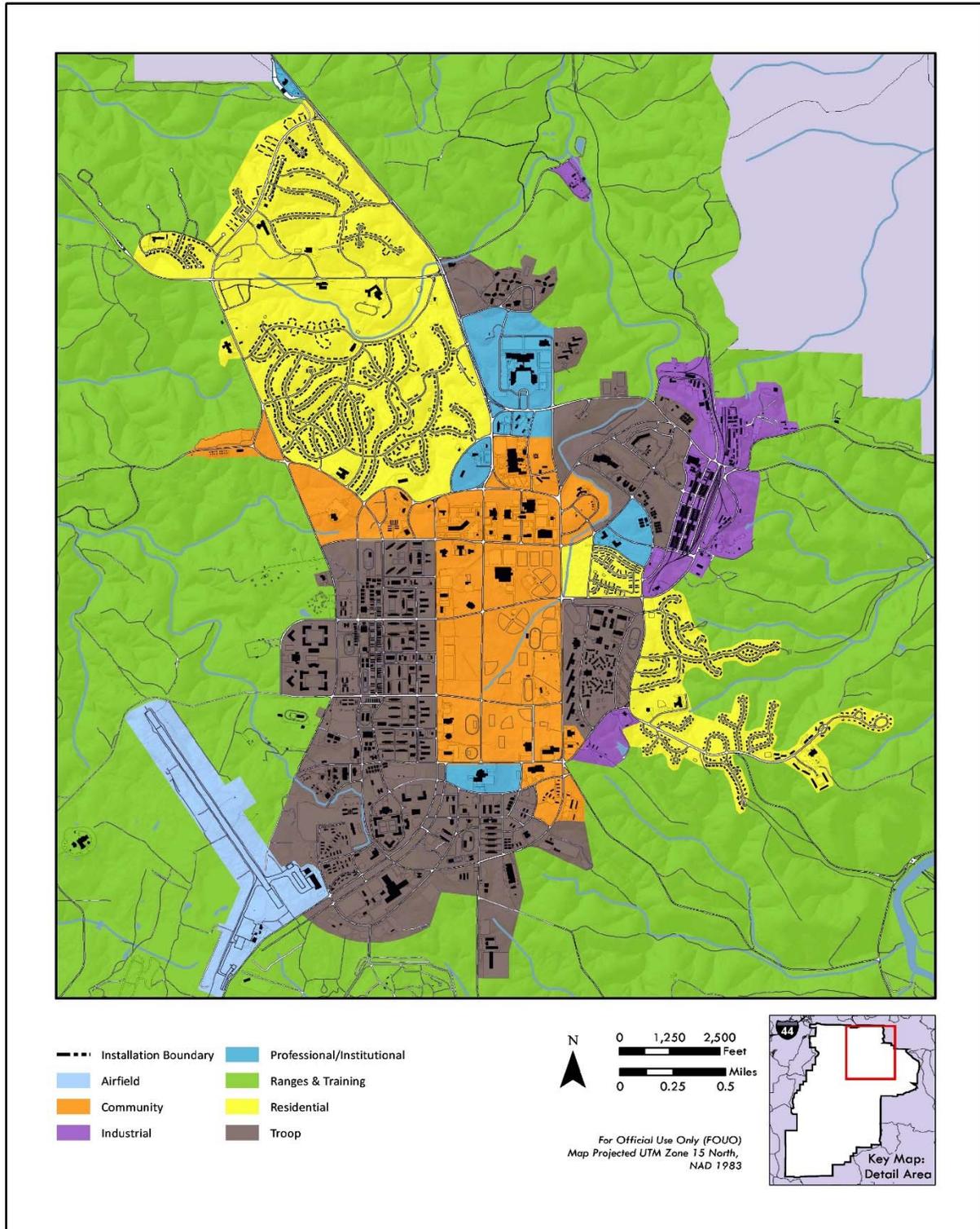


Figure 3-8. Land Use Categories within the Fort Leonard Wood Main Cantonment

The main community support facilities include, but are not limited to, chapels, restaurants, banks, hospitals and clinics, education centers, the post office, post exchanges/commissaries, child development center, theater, bowling center, community center, equestrian center, fire stations, gym/fitness centers, and museum. Sports and recreation fields occupy the center of the community support area. In general, the community facilities at FLW are spread out and most are not within walkable distance of each other. The area around the post exchanges/commissaries is sometimes referred to as downtown (Area 1); however, its edges and center are not clearly defined.

Professional/Institutional

The professional/industrial land use category provides for non-tactical organizations including military schools; headquarters (HQ); major commands; and non-industrial research, development, test and evaluation facilities. The professional/institutional land use at FLW is located in three different areas. The largest section of this land use is north to the central community land use along 1st Street, consisting of the MSCoE (Area 10) HQ building, the Directorate of Information Management, Defense Connect Online (DCO) Administration, general instruction and library facilities, and several other administrative and institutional facilities.

Another professional/institutional land use area is the University of Missouri's Technology Park. The land is currently leased to the University of Missouri and was developed by the university and the Missouri Department of Economic Development. It is bordered by Replacement, Louisiana, and Oklahoma Avenues and East 2nd and 5th Streets.

The third section and smaller professional/institutional land use area is the Military Police HQ located south to the central community area.

Troop

The troop land use category is assigned to, and being used for, operational facilities for Table of Organization and Equipment units, the BCT/OSUT complexes (Area 2), and for selected Initial Entry Training complexes. The goal of this land use is to provide contiguous facilities for related organizations to facilitate operational readiness, support operations security for deployable units, and improve circulation and movement of trainees between sleeping, eating, and training facilities. The FLW troop area includes the following:

- A small troop area northeast to the University of Missouri's Technology Park at the East Wood area encompasses Grant Hall, Reception Barracks, and specialized training facilities.
- The troop areas east and north to the MSCoE HQ building are the barracks for MSCoE students.

- The largest troop area at FLW surrounds the Community Zone (Area 14) to the west, south, and east. The troop area houses mission support functions for the Army National Guard and National Guard Bureau, BCT/OSUT, AITs, and U.S. Army Reserve.
 - BCT/OSUT (Area 2) is located entirely west of Iowa Avenue. This area is currently experiencing an extensive facility upgrade. Twenty new basic training barracks have been constructed with a long-term plan for the construction of an additional 10 barracks.
 - AIT functions are located in two general areas—AIT South (Area 4) and AIT East (Area 7). The one south of South Dakota Avenue is neighboring other troop functions, i.e., National Guard and U.S. Army Reserve. The other AIT area is east of Nebraska Avenue, encompassing the existing Specker Complex. Currently under construction are four standard-design, multi-story barracks with integrated company operations facilities, BN HQ, dining facility, and an outdoor running track. The AIT facility complex can accommodate 1,200 Soldiers. The Installation’s plan for the next phase is to expand the AIT facility complex along the eastern edge of the Specker Complex to accommodate all known requirements for another 1,200 Soldiers.

Airfield

The airfield land use category is for flight operations including runways, taxiways, airfield support facilities; including airfield operations, aviation refueling, aviation maintenance, and related test facilities. At FLW, the airfield is an elongated, T-shaped area of approximately 237 acres that stretches southwest to northeast off the southwest corner of the Main Cantonment. Iowa Avenue skirts the southern edge of the airfield area, and Kansas Avenue crosses its northern section. At the Southern end of the runway are hangar facilities, parking areas, and other aircraft support facilities.

Industrial

The industrial land use category is designated for production, maintenance, depot, and storage facilities, as well as activities that generate heavy traffic and pollution. Industrial land use at FLW consists of approximately 430 acres distributed among one primary industrial area and multiple smaller industrial clusters.

The primary industrial area at FLW is located on the northeast side of the Main Cantonment to the north of Area 12, East Residences. It is organized along the railroad line. This area consists of several general purpose warehouses and storage facilities, recycling facilities, a car rental facility, a kennel, the DPW administration facility, a laundry, the central heat plant, and a railhead and associated buildings, such as

the railroad administration building. Another small industrial area, the site of the wastewater treatment plant, is located northeast to the Main Cantonment.

Residential

This land use provides space for Family housing and unaccompanied enlisted personnel housing (or UEPH barracks). If needed, it may also include Family services and other neighborhood services. FLW's residential land uses are primarily located at two general locations—East Residences (Area 12) and North Residences (Area 13)—together amounting to approximately 1,880 acres.

Each residential area consists of one UEPH community and one Family housing area. Those Family housing areas were privatized in 2005 under the Army's Residential Communities Initiative Program with Balfour Beatty Communities as the developer. The largest portion of residential land use—North Residences (Area 13)—forms the northwest extent of the Main Cantonment and is bounded by Missouri Avenue to the east, Polla Road and Indiana Avenue to the west, and North Dakota Avenue to the south. This area also has schools, a chapel and a youth services center. Pulaski Avenue bisects this residential area, creating a distinction between its northern and southern portions. The UEPH community is located at the northwest portion of this residential area and is separated by Indiana Avenue from Family housing. The other significant residential area is in the easternmost reach of the Main Cantonment—East Residences (Area 12). It contains additional Family housing, including Company Grade, Warrant Officer, Colonel, and General housing, as well as a grade school, transient quarters and the Pershing Community Club located off Piney Hills Drive. The UEPH community is nearer to the center of the Installation and shares a corner with the East Residences. This community is being constructed in five phases. Three of those phases are now complete and occupied.

3.9.2 Environmental Consequences

3.9.2.1 Alternative 1 – No Action

Under the No Action Alternative, implementation of projects to address facility deficits and excesses would occur on an informal basis without an established framework that enables suitable location of projects that address the large-scale functional relationships at FLW. Projects occurring on an informal basis to address facility deficits and excesses would occur on existing facilities or already developed or previously disturbed areas. As such, changes to existing land uses are not anticipated and any changes to existing facilities are expected to conform to land use plans and policies.

The failure of this alternative to address existing operational deficiencies would result in the continued use of existing, inefficient facilities that are not effectively designed to support the mission and needs of FLW. Consequently, implementation of the No Action Alternative could result in potentially less than

significant impacts to land use as a result of reducing the ability of Installation to meet current and projected mission requirements.

Overall, impacts to land use under Alternative 1 are expected to be adverse, but less than significant, from continued operational deficiencies.

3.9.2.2 Impacts Common to Both Action Alternatives

Under both Action Alternatives, FLW would implement the RPMP Update, which includes the IDP, IDG, the Capital Investment Strategy, and several short-term construction projects within the Main Cantonment.

Projects associated with the IDP primarily consist of a series of framework and network plans to help delineate and focus growth within the Main Cantonment. Roadway, transit, and pedestrian and bicycle network plans would expand on the existing transportation network to reduce congestion and improve connectivity within the Installation. The execution of these plans, while not likely to occur in previously undeveloped areas, is not anticipated to be inconsistent with existing or proposed future land uses and will be consistent with applicable development plans; therefore, this development would not adversely affect land use. The increase in connectivity between existing and potential future land uses as well as the emphasis on development cores highlighted by these networks could result in overall beneficial impacts to land use and the military mission at FLW.

Utility developments including the construction and operation of potential power plants, CHP plants, ground source heat exchange sites, and wind and solar sites could potentially affect land use. The potential development of these energy technologies would take land and permanently and temporarily alter existing land uses within the Main Cantonment and potentially in the non-cantonment area, particularly for wind and solar. These land uses have been identified by FLW as being compatible with existing land uses and the military mission, resulting in long-term, beneficial impacts to land use. Routine maintenance activities associated with these developments are expected to be short term in nature and would not alter land use, resulting in no impacts. In addition, further studies would occur prior to siting and development to ensure compatibility to surrounding land uses and natural and cultural resources as well as to ensure consistency with applicable land use policies and regulations.

The emphasis and use of ADP districts to guide potential development within each district would result in the demolition of facilities as well as the siting and construction of new structures and facilities.

Development in the ADP districts would permanently and temporarily alter existing land uses within the Main Cantonment and non-cantonment areas. The identification by FLW of these land uses as being

compatible with and highlighting existing land uses and district desired future land uses as well as the military mission would result in potentially beneficial impacts to land use.

Similarly activities under the Capital Investment Strategy as well as those identified under short-term projects could have some beneficial impacts to land use as a result of the recognition by FLW of these land uses as being compatible with and highlighting existing land uses, desired future land uses and the military mission.

Activities associated with the IDG are not anticipated to alter existing land uses, but instead guide design of facilities and, therefore, would result in no impacts to land use.

Overall, impacts to land use as a result of actions common to both alternatives are expected to be beneficial from increased connectivity and land use compatibility.

3.9.2.3 Alternative 2 – Spine Roadway Option

Under Alternative 2, the Spine Roadway Option, FLW would implement a north-south transportation route, providing a direct route to the range area from the Main Gate, as described in Section 2.2.2.

Construction of this route is not anticipated to conflict with existing land uses and would be consistent with development plans; therefore, the Spine Roadway Option would not adversely affect land use. The increase in connectivity between existing and potential future land uses as well as the emphasis on development cores highlighted under this alternative could result in overall beneficial impacts to land use.

Overall, impacts to land use under Alternative 2 are expected to be beneficial from increased connectivity and land use compatibility.

3.9.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, is not anticipated to alter existing land uses, to conflict with existing land uses, or to be inconsistent with development plans; therefore, the Loop Roadway Option would not adversely affect land use. The increase in connectivity between existing and potential future land uses as well as the emphasis on development cores highlighted under this alternative could result in overall beneficial impacts to land use.

Overall, impacts to land use under Alternative 2 are expected to be beneficial from increased connectivity and land use compatibility.

3.10 Noise

The ROI for the analysis of noise includes the potential areas of development at FLW and the immediate vicinity of those areas.

3.10.1 Affected Environment

Noise within and around FLW occurs generally as a result of transportation, aviation, military training, and construction activities. Persistent, continuous sources of noise (such as traffic on major roads during daytime hours) may contribute only minimally to background noise levels compared to louder but more infrequent or intermittent generators of noise (such as construction noise and military training activities). Military-related noise generation and noise impacts have been previously studied at FLW (USAEHA 1983). The primary military-related noise generators include explosion of land mines, detonation of ammunition, firing on small arms ranges and grenade ranges, and aircraft noise associated with Waynesville Regional Airfield at Forney Army Airfield and Cannon Range. Secondary noise generators include blasting at the quarry, operating of heavy equipment operations on Training Area 244, vehicular traffic, artillery fire by the Reserve Component Soldiers along with stationary sources such as electric generators and air conditioners. Noise zones are classified into three levels with regard to their compatibility with certain land uses. These zones are described as follows:

- **Noise Zone I (acceptable)**—the area where the day-night sound level (DNL) is less than 65 decibel (dB), A-weighted scale (dBA). This area, considered to have moderate to minimal noise exposure from aircraft operations, weapons firing, and other noise sources, is acceptable for noise-sensitive land uses including residences, schools, and medical facilities.
- **Noise Zone II (normally unacceptable)**—the area where the sound level is between 65 and 75 dBA DNL. This area is considered to have a significant noise exposure and is, therefore, normally unacceptable for noise-sensitive land uses. Zone II boundaries generated by aircraft operations and heavy weapons training extend beyond the Installation boundary at the following locations: approximately 133 acres in unincorporated Pulaski County on the southeast boundary of the Installation and approximately 5 acres adjacent to Parcel 7 near the southwest quadrant of the Installation, north of Cannon Range.
- **Noise Zone III (unacceptable)**—the area where the DNL is greater than 75 dBA. This zone is considered an area of severe noise exposure and is unacceptable for noise-sensitive activities. All Noise Zone III areas generated by range and aircraft operations are within the Installation boundaries and are primarily located near the weapons firing ranges and the airfield.

3.10.2 Environmental Consequences

3.10.2.1 Alternative 1 – No Action

Because current land management practices would continue under the No Action Alternative, noise impacts would not change. Development at FLW would continue in the absence of the RPMP Update and

would occur as needed for particular purposes identified at the time with no specific amount of development determined. Both direct and indirect, adverse impacts from noise would occur as a result of continuing construction activities at the Installation; however, adverse impacts are expected to be less than significant and short term. Implementation of the No Action Alternative would not result in noise levels that exceed the compatibility standards for noise zones at FLW or produce occupational noise levels that exceed 85 dB for an 8-hour day. Thus, adverse impacts from noise would not be considered significant.

Overall, impacts to noise under Alternative 1 are anticipated to be adverse, but less than significant, as a result of continuing construction activities.

3.10.2.2 Impacts Common to Both Action Alternatives

Direct, short-term, adverse noise impacts would occur under both Action Alternatives as a result of noise generated from demolition and associated construction activities. Adverse impacts would occur from construction equipment engaged in site preparation activities, contributing to overall noise levels experienced at the Main Cantonment. Construction of new sidewalks and trails under the Pedestrian and Bicycle Networks Plan would result in short-term noise disturbances during construction. Construction activities associated with the removal of existing concrete channels and widening of drainage areas under the Green Infrastructure Plan, as well as the construction of new sidewalks and trails under the Pedestrian and Bicycle Networks Plan, would also temporarily contribute to noise sources at the Installation.

Similarly, the development of buildings and supporting infrastructure at the 15 ADP districts and the construction of short-term projects (identified in Table 2-4) would result in short-term noise impacts at various locations throughout the Installation; however, these noise impacts are not be expected to exceed 65 dB for extended periods in areas of the Main Cantonment designated as Zone I (acceptable).

Indirect, long-term, beneficial impacts would occur from reduced transportation-related noise sources at the Main Cantonment as the result of transitioning existing diesel buses to hybrid electric or natural gas vehicles under the Transit Network Plan. Such reductions, however, would be minimal in the context of overall noise sources at the Installation. Indirect, long-term, adverse impacts to noise levels at the Main Cantonment would occur as the result of the potential installation of a light rail system under the Transit Network Plan and the addition of new power facilities under the Utilities Framework Plan. The incremental contributions of these noise sources would, however, be minimal in the context of overall noise environment at the Installation.

Overall, adverse noise impacts stemming from the Action Alternatives would be short term.

Implementation of the aforementioned plans under the Action Alternatives are not expected to result in

noise levels that exceed the compatibility standards for noise zones at FLW or produce occupational noise levels that exceed 85 dB for an 8-hour day. Thus, overall, adverse impacts to existing noise levels at the Installation would not be considered significant.

Overall, impacts to noise from actions common to both alternatives would be both beneficial from reductions in transportation-related noise sources and adverse, but less than significant, from construction and from light rail and facility operations.

3.10.2.3 Alternative 2 – Spine Roadway Option

Under Alternative 2, the Spine Roadway Option, short-term noise impacts from construction and long-term noise impacts from operation would be the same as those described previously. The concentration of noise impacts would occur at the center of the Main Cantonment.

Overall, impacts to noise from Alternative 2 would be less than significant from construction and infrastructure operation.

3.10.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Under Alternative 3, the Loop Roadway Option, short-term noise impacts from construction and long-term noise impacts from operation would be the same as those described previously. The concentration of noise impacts would occur at the outer edges of the project area away from the center of the Main Cantonment.

Overall, impacts to noise from Alternative 3 would be less than significant from construction and infrastructure operation.

3.11 Socioeconomics and Environmental Justice

3.11.1 Affected Environment

The ROI for the socioeconomic analysis comprises three counties—Laclede, Phelps, and Pulaski counties, Missouri. These counties represent the majority of the area where the workforce for project-related activities would occur (U.S. Department of Commerce 2011). FLW is located in Pulaski County, which realizes the greatest social and economic impacts from the Installation. These impacts include off-Installation purchase and rental of housing, purchase of goods and services, and employment generation related to DoD civilian and military employment associated with FLW.

3.11.1.1 Population

Regional Population

The population in the ROI increased from 113,503 in 2000 to 131,952 in 2012, representing an approximate 16 percent increase in the ROI compared to a 7 percent statewide increase. The cities of St. Robert and Waynesville experienced the greatest direct population impacts from FLW because these two communities supply a large proportion of the off-Installation housing, commercial goods, and services for Installation employees. Waynesville, the larger of the two incorporated communities, has shown a steady increase in population since 1980, and the population of St. Robert had a population increase of 58 percent from 2000 to 2012 (U.S. Department of Commerce 2000a and 2012a).

Fort Leonard Wood Population

FLW experiences annual population increases during the summer from the influx of active and Reserve Component Soldiers assigned for training. Populations include permanent party military officers, NCOs and enlisted officers, Army civilians, non-appropriated fund civilians, and contractors, as well as other military service personnel attending training at the Installation. Military personnel include all services—Army, Navy, U.S. Marines, and Air Force.

Table 3-5 provides an inventory of the most current (FY 2011) military and civilian populations directly associated with FLW. As shown on the table, the total average population on the Installation is approximately 33,215 persons every day (Premont 2015, FLW 2014b). The portion of the Soldiers and Army civilian population living off the Installation is estimated to be 16,254 and consists of Soldiers, Army civilians, and their Family members (Lloyd 2014).

Table 3-5. Fort Leonard Wood On-Installation Population, FY 2011

Personnel	Number
Military	
Permanent party	9,161
Trainees and students	18,151
Total military personnel	18,836
Civilian personnel	9,409
Total military and civilian personnel	28,245
Other	
Military Family members on the Installation	5,190
Total	33,215

Source: Lloyd (2014)

3.11.1.2 Income

Between 2008 and 2012, the annual median household incomes in Laclede, Phelps, and Pulaski counties, on average, were \$39,101, \$41,388 and \$47,251, respectively. Pulaski County's annual median household income was equivalent to the state's median household income, while Laclede and Phelps counties' median household incomes were 17 and 13 percent lower than the state's median household income, respectively (U.S. Department of Commerce 2012b).

3.11.1.3 Labor Force, Unemployment, and Employment by Industry

Labor Force

The annual Army civilian labor force within the ROI was approximately 56,846 persons in 2012. The average annual unemployment rate in the ROI in 2012 was 8 percent, 1 percent higher than the state-wide average for Missouri. The current labor force represents an approximate 8 percent increase since 2000, substantially greater than the statewide increase of 1 percent during the same period. The majority of the labor force increase occurred in Phelps and Pulaski counties (BLS 2012).

Employment

The total number of employed persons within the ROI was approximately 52,445 in 2010, an increase of 3 percent from the year 2000. The majority of the employment increase occurred in Pulaski County, while Laclede County experienced a decline in employment. During this period, the total number of employed persons state-wide decreased by 3 percent (BLS 2012).

Annually, on average, between 2008 and 2012, the total number of government jobs in the ROI made up 24 percent of all jobs within the ROI, while private wage and salaried jobs made up 69 percent of all jobs. Within Pulaski County, the total number of government jobs accounted for 39 percent of all jobs. Educational services, and health care and social assistance composed the largest industry by total jobs with 23 percent of all jobs in the ROI. The public administration industry had 11 percent of all jobs located in the ROI and 24 percent of all jobs in Pulaski County (U.S. Department of Commerce 2012b). In 2011, FLW employed more than 9,000 Army civilians in a variety of fields, such as information technology, medical, engineering and accounting, boasting an annual economic impact of about \$3 billion (FLW 2014b).

3.11.1.4 Housing

Regional Housing and Household Characteristics

Annually, on average, between 2008 and 2012, 53,151 housing units were located within the ROI. Greater than 45 percent of all occupied housing units in Pulaski County are renter occupied—a much higher rental

occupancy rate than for the region (U.S. Dept. of Commerce 2012c). Approximately 50 percent of the permanent party military personnel at FLW live off the Installation (Premont 2015). A high percentage of FLW military personnel live in communities surrounding the Installation, especially in the nearby cities of St. Robert and Waynesville but also farther out in the cities of Richland, Crocker, and Dixon and the unincorporated communities of Laquey, Swedeborg, and Devil's Elbow. Military personnel assigned to training areas on the south end of the Installation sometimes choose to live in the unincorporated areas of Big Piney and Palace in Pulaski County or in the northern Texas County communities of Plato and Roby (FLW 2014b). FLW provides housing for married and unmarried permanent party personnel on the Installation as well as temporary and student military personnel.

3.11.1.5 Government and Emergency Services

Health and Medical Facilities

The General Leonard Wood Army Community Hospital, in the north central part of the Main Cantonment, is the largest health care facility within the ROI and is ranked among the largest Army community hospitals. The 500-bed facility has a 65-bed daily occupancy and offers a full range of medical and dental services to active military personnel, military retirees, and dependents. The hospital also operates a Family member outpatient clinic that averages more than 1,000 daily patient visits. Troop medical and dental clinics to support initial screening and medical care for active duty military personnel are located near troop housing areas. The hospital offers medical care to civilians from the surrounding communities if, in the case of emergency, they cannot be safely transported to other area facilities (General Leonard Wood Army Community Hospital 2014, FLW 2014c).

Medical facilities off the Installation provide a comprehensive range of primary and secondary health care services for the area. Six hospitals, located in the surrounding nine-county area, have a capacity of more than 800 beds. The largest of these hospitals include the 259-bed Phelps County Regional Medical Center in Rolla, the 99-bed Lake of the Ozarks General Hospital in Osage Beach, and the 41-bed Breech Medical Center in Lebanon. Tertiary medical care is available less than 2 hours from FLW in Columbia and Springfield, and Truman Veterans Hospital also located in Columbia (General Leonard Wood Army Community Hospital 2014).

Law Enforcement

General law enforcement responsibility at FLW is divided between the Provost Marshal's Office and the U.S. Army Criminal Investigation Command. Under the Uniform Code of Military Justice, military authorities have off-Installation jurisdiction over offenses committed by military personnel. The military

law enforcement authorities coordinate their off-Installation activities with local law enforcement authorities on a case-by-case basis.

In terms of law enforcement off the Installation, the Pulaski County sheriff has jurisdiction for the entire county, except FLW. The municipalities of Waynesville, St. Robert, Dixon, Richland, and Crocker have their own police forces.

Fire Protection

The FLW Fire Department provides all fire protection services on the Installation with two fire stations currently in use.

Fire protection and EMS services off the Installation are provided by the City of St. Robert Fire and Rescue Department and the Waynesville Fire Protection District.

Education

As of 2011, according to the Draft IDP, seven main school districts are fully or partly located within the borders of Pulaski County, not counting two small districts that are mostly within other counties and only have a few dozen residents within Pulaski County. All seven school districts have a high percentage of FLW military dependents and more than two-thirds of Waynesville students fall into that category.

The cities of Waynesville and St. Robert and FLW, along with their surrounding rural areas running east to Devil's Elbow, are served by the Waynesville R-VI School District, which is by far the largest in the county (FLW 2014b).

3.11.1.6 Environmental Justice and Protection of Children

Environmental Justice

On 11 February 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Executive Order 12898 directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. The general purposes of this executive order are to:

- Focus the attention of federal agencies on human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice
- Foster nondiscrimination in federal programs that substantially affect human health or the environment

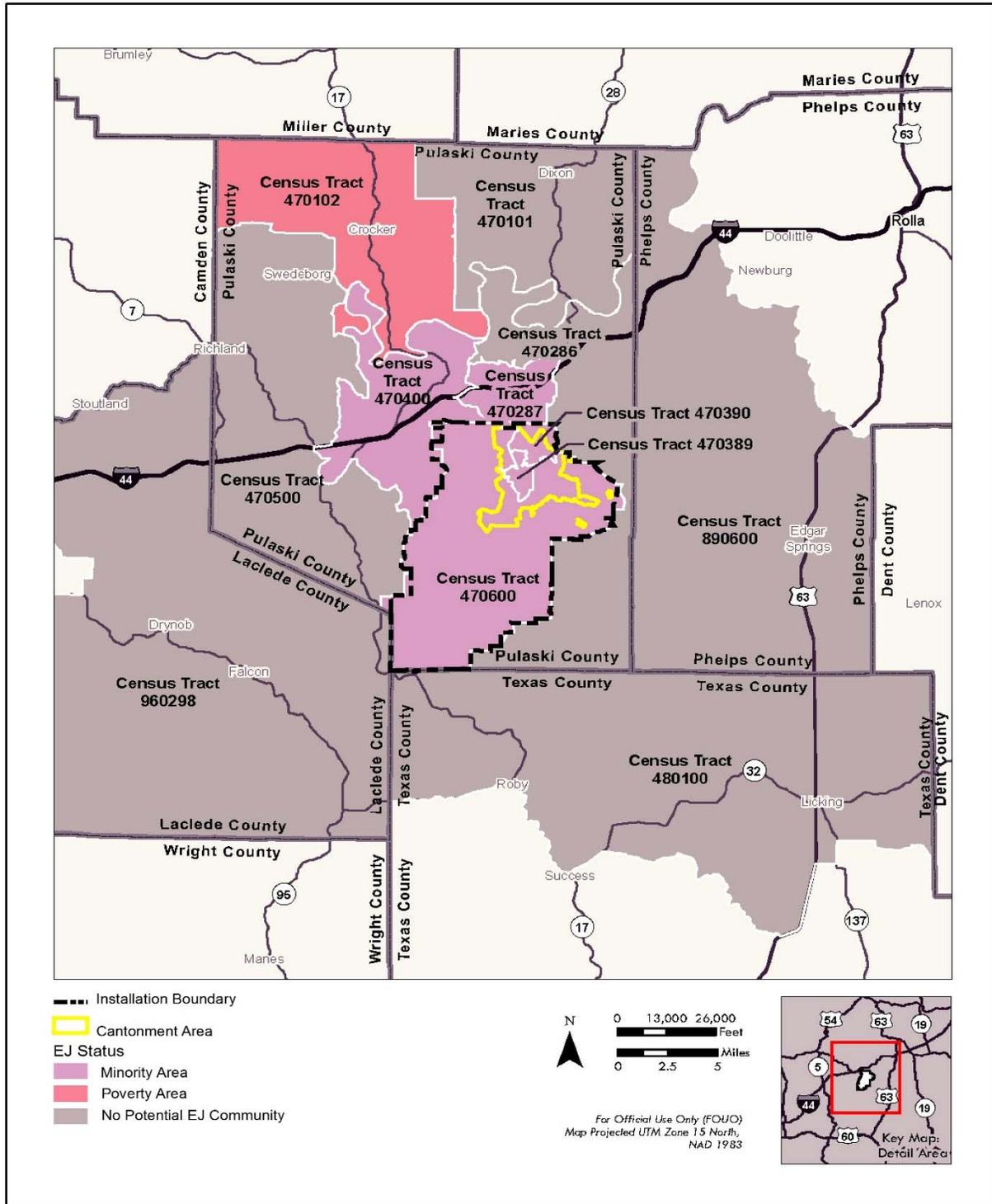
- Improve data collection efforts on the impacts of decisions that affect minority communities and low-income communities and encourage more public participation in federal decision-making by ensuring documents are easily accessible (e.g., available in multiple languages and made readily available)

As defined by the Environmental Justice Guidance under NEPA (CEQ 1997a), “minority populations” include persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Race refers to census respondents’ self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, and Central or South American.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are identified using the Census Bureau’s statistical poverty threshold, which is based on income and Family size. The Census Bureau defines a “poverty area” as a census tract with 20 percent or more of its residents below the poverty threshold and an “extreme poverty area” as one with 40 percent or more below the poverty level. A census tract is a small geographic subdivision of a county and typically contains between 1,500 and 8,000 persons (U.S. Department of Commerce 2000b).

Twenty-five census tracts were located within the ROI as of the year 2012. In 2012, three census tracts within Laclede County had at least 20 percent of their population living below the poverty level. Phelps County had one census tract with at least 20 percent of its population living below the poverty level and another with at least 40 percent of its population living below the poverty level. Pulaski County had one census tract with at least 20 percent of its population living below the poverty level and five census tracts with minority populations whereby the percentage of respondents identifying themselves as a minority made up a proportion of their census tract that was at least 10 percent or higher than the minority population at the state level. Census Tract 470600 covers the majority of the FLW, while Census Tracts 470390 and 470389 cover a majority of the Main Cantonment.

Figure 3-9 shows those census tracts for FLW resides and census tracts within 1 mile of the Installation (U.S. Department of Commerce 2012b 2012d).



Source: U.S. Dept. of Commerce (2012b and 2012d)

Figure 3-9. Potential Environmental Justice Census Tracts

Protection of Children

Executive Order 13045, *Protection of Children from Environmental Health and Safety Risk*, requires federal agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that might disproportionately affect children. This Executive Order, dated 21 April 1997, further requires federal agencies to ensure that their policies, programs, activities, and standards address these disproportionate risks. Executive Order 13045 defines environmental health and safety risks as “risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink and use for recreation, the soil we live on and the products we use or are exposed to).”

Children reside in neighborhoods and schools at and in proximity to FLW and walk along the sidewalks of roadways supporting the Installation. Children also attend daycares both on and off the Installation and reside on the Installation within Family housing. Impacts to children specific to the Action Alternatives are identified in the following impacts analysis.

Any mitigation for environmental justice impacts or impacts to children would need to be determined under a future tiered NEPA evaluation process.

3.11.2 Environmental Consequences

Socioeconomic impacts from the alternatives on the ROI’s demographics, employment, income, and housing as well as impacts that could occur to community and public services, such as law enforcement, fire and rescue, schools, and medical services, are examined in more detail in the following text.

Environmental justice impacts and impacts to children are addressed, where applicable.

Estimated impacts to employment, business volume, population, and income as well as impacts to community and emergency services, such as, housing, and law enforcement, medical services, and fire protection are assessed qualitatively. The significance of impact to these resources depends on the services, but generally impacts to these services are defined as beneficial, no impact, less than significant, significant but mitigable, or significant according to the definitions of these terms at the beginning of this chapter.

Environmental justice impacts and impacts to children are assessed separately from the analysis of the other socioeconomic resources because environmental justice populations and populations of children can be more sensitive than other socioeconomic resources to environmental changes. An environmental justice impact is considered to be significant if the impact from an alternative disproportionately and adversely affects a minority or low income community. An impact to a population of children is

considered to be significant if the impact from an alternative disproportionately and adversely affects a population of children.

3.11.2.1 Alternative 1 – No Action

Under the No Action Alternative, the RPMP Update would not be implemented and management of FLW would continue based on the existing RPMP. Benefits to economic development, employment, and income associated with the construction activity that is tied to plans that would be implemented under the Action Alternatives would not occur.

Development of the short-term projects would occur on an informal basis under the No Action Alternative. The construction of these projects would have short-term, beneficial impacts to employment, income, and sales in the ROI during the construction period. If any of these projects were to require construction workers to temporarily relocate to the ROI during the construction period, the population within the ROI would increase in the short term. If any of these projects were to require adding additional military or civilian positions for their operation, long-term impacts to population in the ROI would occur if these positions are filled by persons relocating to the ROI for these jobs. Spending by temporary construction workers or permanent employees who relocate to the ROI to fill these positions would have a beneficial impact on employment, income, and sales in the ROI because these persons spend their incomes within the ROI.

Government and emergency services would only be affected to the extent that they would be required to render assistance during the construction period if construction workers need medical care or construction projects on the Installation require additional fire or police support. During the operation of these short-term projects, government and emergency services would be affected only to the extent that persons who relocate to the ROI to work on these projects would use these services or through any cooperative agreement support, if cooperative agreements are in place during the operation of these projects, that may be rendered by fire or police services to the project sites.

Specific socioeconomic impacts, environmental justice impacts, or impacts to children related to these short-term projects would be explored under a future tiered NEPA evaluation process once more project details and information are available.

Overall, impacts to socioeconomics under Alternative 1 would be beneficial as a result of economic growth associated with the procurement of goods and services.

3.11.2.2 Impacts Common to Both Action Alternatives

Construction and operation of projects as set out in the Roadway Network Plan, Transit Network Plan, Pedestrian and Bicycle Networks Plans could have short-term, beneficial impacts to employment and income in the ROI as a result of construction workers temporarily relocating to the ROI during the construction period of these projects. If any of these workers relocate to the ROI, the population would temporarily increase during the construction period, and any construction-related spending on goods and services within the ROI would benefit sales, employment, and income in the ROI.

If any of the plan projects require adding additional military or civilian positions at the Installation, the population in the ROI would be experience additional, long-term impacts. Spending by temporary construction workers or permanent employees who relocate to the ROI to fill these positions would have a long-term, beneficial impact on employment, income, and sales as these persons spend their incomes within the ROI.

Similar to the short-term project impacts described for Alternative 1, government and emergency services would only be affected to the extent that they would be required to assist during the construction period if construction workers need medical care or construction projects require additional fire or police support. During project operation, government and emergency services would be affected only to the extent that persons who relocate to the ROI to work on these projects would use fire or police services or through any cooperative agreement to provide support, if cooperative agreements for these services are in place during the operation of these projects.

Specific socioeconomic impacts, environmental justice impacts, or impacts to children related to these short-term projects would be explored under a future tiered NEPA evaluation process once more project details and information are available.

Similar socioeconomic impacts would occur from the demolition of current facilities as well as the construction and operation of new projects described under the Green Infrastructure Framework Plan, Utilities Framework Plan, and Area Development Plans.

Operation of new businesses, to the extent that new businesses are created under these plans, would also have long-term, beneficial impacts on the ROI through the creation of new employment, sales, and income. If any of these new businesses attract permanent workers to the ROI to work in these businesses, local population and housing would also be impacted. Government and emergency services would be affected by construction of these businesses and any change in population that they bring. During the short-term impacts to government and emergency services would be limited to impacts related to the

construction of these businesses. During the long-term impacts would be related to changes in business volume and the total population change off the Installation.

Schools in the ROI could be affected by any project under these plans to the extent that any population change in the ROI causes a change in enrollment in local schools. Specific impacts to schools would be determined in a future tiered NEPA evaluation process based on specific project impacts on the local population in the ROI.

Overall, impacts to socioeconomics as a result of actions common to both alternatives would be beneficial as a result of economic growth associated with the procurement of goods and services.

3.11.2.3 Alternative 2 – Spine Roadway Option

Alternative 2, the Spine Roadway Option, involves constructing a roadway that would pass in proximity to a school on the Installation. Impacts to children at this school, resulting from construction and operation of this roadway would need to be assessed under a future tiered NEPA evaluation process. In addition, this alternative would require the construction of 1,800 feet of major roadway. The socioeconomic impacts of this roadway construction and all other impacts under this alternative would be similar to impacts as described previously under Impacts Common to All Action Alternatives. Specific project-related impacts to socioeconomic impacts, environmental justice impacts or impacts to children would require a future tiered NEPA evaluation process.

Overall, impacts to socioeconomics under Alternative 2 would be beneficial as a result of economic growth associated with the procurement of goods and services.

3.11.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

The implementation of Alternative 3, the Loop Roadway Option, would have greater socioeconomic impacts than those described for Alternative 2 because this alternative would require the development of approximately 10,000 feet of roadway. The Loop Roadway Option would result in greater, short-term impacts to local income, employment, sales and population in the ROI than the Spine Roadway Option. In addition, this option would not require a roadway to pass near a school, resulting in fewer impacts to children. All other impacts under this alternative would be the same as those described previously, and specific project-related impacts to socioeconomic impacts, environmental justice impacts or impacts to children would require a future tiered NEPA evaluation process.

Overall, impacts to socioeconomics under Alternative 3 would be beneficial as a result of economic growth associated with the procurement of goods and services.

3.12 Utilities and Services

The ROI for utilities is limited to FLW and outside utility providers in the nearby communities of Waynesville and St. Robert.

3.12.1 Affected Environment

3.12.1.1 Electrical

As described under Section 3.5, *Energy*, electricity consumption accounts for 44.1 percent of the energy use at FLW. The electrical distribution system supplies electricity to approximately 1,360 buildings, including 3 central energy plants. SHO-ME Power Electric Cooperative supplies 69-kV power to FLW. Substation 4 serves as the main service entrance to the Installation from SHO-ME Power Electric Cooperative, which feeds Substations 1, 2, 3, and 5 where the primary distribution voltage is stepped down to 12,470 volts for distribution. Laclede Electric Cooperative owns and maintains the 12,470-volt primary lines and secondary transformers on the Installation. Secondary 480/208 volt distribution to individual facilities is owned by FLW Operations and Maintenance Department and maintained through the use of private subcontractors. To comply with the Army Metering Implementation Plan, FLW began the installation of electric meters in 2009, and as of July 2010, it had installed approximately 454 electric meters across the Installation. Laclede Electric Cooperative owns and maintains the 12,470-volt primary lines and secondary transformers on the Installation. Secondary 480/208 volt distribution to individual facilities is owned and maintained by FLW Operations and Maintenance Department through the use of private subcontractors. To comply with the Army Metering Implementation Plan, FLW began to install electric meters in 2009, and as of July 2010, it had installed approximately 454 electric meters across the Installation.

Substation 2 has been expanded and a new substation (Substation 6) has been constructed. Future improvements on the electrical system include upgrading capacity of part of the 69-kV distribution loop and construction of another new substation targeted for FY 2014 has been completed.

The fact that SHO-ME Power Electric Cooperative is nearing its maximum base capacity and the single point of entry to the Installation are threats to the security of power at FLW. Currently, 31 petroleum fueled generators are installed at various locations to provide power during outages. FLW is planning to build a power plant on the Installation using natural gas, diesel, or biodiesel to ensure power security.

3.12.1.2 Natural Gas

As described in the Energy section, Omega Pipeline Company delivers approximately 573 million cubic feet of natural gas per year to FLW, approximately 43 percent of the Installation's overall energy consumption. Omega Pipeline Company owns and maintains all distribution lines from the point of entry

to the Installation up to and including the gas meters. All gas infrastructures downstream of the meters is owned by FLW and maintained by a subcontractor.

FLW has one natural gas entry point at a distribution and mixing station located near the Main Gate. The station is shared by the Installation and nearby communities of St. Robert and Waynesville. The inlet pressure to the distribution station varies upon upstream demand and can be up to 600 pounds per square inch gauge (psig). From the regulator station, natural gas is delivered to the Installation at 70 psig, and is further regulated downstream. As part of the energy reduction initiative, 125 natural gas meters were installed in 2010. The maximum gas supply available to FLW is estimated to be 14,000 million cubic feet per day.

The natural gas distribution system consists of underground piping from the gas distribution station. The existing distribution network consists of both steel and polyethylene pipes. New construction projects have been using primarily polyethylene piping while the existing steel pipe is protected by a rectified anode bed that is located in the southwest corner of Gammon Field.

The current maximum peak demand for natural gas at FLW is 6,000 million cubic feet per day. With an estimated peak demand increase to 8,000 million cubic feet per day due to planned construction, the Installation has reliable capacity; however, because there is only one entry point, the Installation is susceptible to disruption of delivery.

3.12.1.3 Water

Ninety-seven percent of the water used at FLW comes from Big Piney River intake. The pump house has four electric pumps (two 2.5-million-gallons-per-day (MGD) pumps, and two 4-MGD pumps) and a 2.5-MGD diesel engine backup pump. The raw water intake delivers water to the water treatment plant via two 16-inch mains. These mains are equipped with flow meters and are regularly monitored. The plant has an average daily design flow of 2.4 MGD, a maximum design flow of 9.8 MGD, and currently operates at approximately 40 percent of its rated capacity. The plant was recently upgraded to comply with the USEPA's Long Term 2 Enhanced Surface Water Treatment Rule.

The Indiana Well is the only major production well that serves as a supplement to the Big Piney River intake. It is tied directly into the distribution system for the Installation and provides approximately 3 percent of the potable water supply. The Indiana Well has three pumps and a 2.25-million-gallon ground storage tank.

In addition to the primary potable water system, 13 small satellite wells are capable of providing potable water for remote areas and small clusters of buildings, including the training ranges, the golf course, and

the rock quarry. Some of these wells are currently inactive and none are interconnected with the main distribution system.

The FLW water distribution system consists of primarily cast iron from the 1940s and later system extensions of cast iron, ductile iron, and polyvinyl chloride. The system includes more than 1,100 fire hydrants and five elevated 500,000-gallon storage tanks. Discussions with DPW staff revealed that the system has many leaks and requires frequent repairs because of its old age and deterioration.

Because water is readily available and economical, FLW requires minimal metering of water on the Installation, and the vast majority of the meters are for reimbursable customers, such as post exchanges, contractors, and schools. As part of the Net Zero initiative, FLW is planning to expect water metering after the completion of electrical metering in FY 2013.

FLW has few security concerns regarding the potable water system because the water source is a government-owned and self-contained. Two possible issues are upstream contamination of the Big Piney River or catastrophic damage to the pump house. Because the single intake location produces up to 97 percent of the potable water for the Installation, FLW is concerned about system redundancy.

Currently only the MSCoE (Area 10) and the ballfields are irrigated by potable water. Non-potable water usage on FLW is primarily used to irrigate Piney Valley Golf Course. The water is pumped directly from the Big Piney River, which is immediately adjacent to the golf course. Future construction projects will include provisions for rainwater reuse.

3.12.1.4 Wastewater

The wastewater collection system at FLW consists of approximately 100 miles of sanitary sewer lines and 55 lift stations. The wastewater treatment plant is located northwest of the Main Cantonment and discharges into Dry Creek, a tributary of the Big Piney River. Wastewater flows into the wastewater treatment plant from two general directions—the Main Cantonment and the North Lieber Heights area. These trunk lines are mainly 10-inch and 12-inch-diameter pipes. The system primarily uses gravity flow; however, lift stations are located where needed throughout the Main Cantonment.

The wastewater treatment plant was recently upgraded to meet regulatory requirements. It is designed for an average daily flow of 5.0 million gallons with a maximum treatable design flow of 8.4 MGD. Currently, the plant operates at approximately 60 percent of capacity, treating about 1.4 MGD on average. The wastewater treatment plant design flow capacity is based on treatment requirements that have been updated in recent years. The MDNR and the USEPA have mandated more stringent monitoring and

treatment requirements for final effluent from the wastewater treatment plant. These new requirements will likely result in an altered design flow capacity to achieve the new target treatment levels.

Because of the aging conditions and the intrusion of tree roots into the clay pipes, significant infiltration and inflow rates occur in the wastewater collection system. Smoke testing has been conducted to locate defects that allows surface and ground water into the system. The majority of main line and lateral defects occur in the Residential Communities Initiative Program housing area (East Residences [Area 12]) and the northern part of BCT/OSUT (Area 2).

3.12.1.5 Storm Water

FLW can be divided into 16 major drainage areas; however, no separate storm sewer trunk system exists at the Installation. Storm drainage is captured into open ditches and culverts that then flow into subsurface storm sewers ranging in size from 18-inch to 42-inch pipes. These storm water control structures convey water from the Main Cantonment to several tributaries, including Dry Creek and Pond Hollow, with eventual discharge into the Big Piney River on the east and Roubidoux Creek on the west.

FLW currently implements a Storm Water Management Program and maintains a Municipal Separate Storm Sewer System (MS4) Permit to comply with the CWA and with the MDNR State Operating Permit. All of the various land disturbance sites on the Installation are permitted (when applicable), and routinely inspected for erosion control, and FLW routinely monitors the outfalls from the Installation. All Installation outfalls discharge to either the Big Piney River or the Roubidoux Creek, and FLW monitors both upstream and downstream of the Installation. In addition, the MS4 permit requires having controls in place to prevent or minimize water quality impacts during construction and operation.

3.12.1.6 Telecommunications

FLW depends on the Directorate of Information Management, DCO for control of its primary communication activities. The DCO provides both telephone and automation services. A new DCO facility was recently constructed to meet projected mission increases for the Installation.

In addition to main communications operations controlled at the DCO, Embarq Missouri (formerly United Telephone of Missouri) serves residential customers on the Installation. Cable America Corporation provides cable television service to subscribers. Cable America Corporation has an office in St. Robert and uses established utility easements to provide cable service to FLW.

3.12.1.7 Central Heating and Cooling System

Facilities at FLW are heated either by one of four central heating plants or by single-building systems. Liquefied petroleum gas is used primarily for space and water heating throughout the Installation. It is

transported via trucks to FLW then stored and used at a number of individual buildings and at a 390,000-gallon tank farm north of 1st Street. FLW uses an estimated 1.5 million gallons of liquefied petroleum gas per year to heat facilities with individual storage tanks. Liquefied petroleum gas from the tank farm is only used to serve the laundry boiler plant and the air injection system to curb peak natural gas usage. The tank farm has the storage capacity to supply the entire Installation for approximately 22 days during peak use.

FLW owns, operates, and maintains all storage tanks and distribution lines, except the tank farm storage tanks that are owned and maintained by Omega Pipeline Company. They are in good condition according to the assessment of the 2011 Comprehensive Energy and Water Master Plan.

Fuel oil Grades 1 and 2 are also used to heat facilities that are not connected to natural gas or liquefied petroleum gas distribution systems. The fuel is delivered to the central storage facility by tankers where the fuel is stored until needed at individual facilities. Tanker trucks with a capacity of 2,000 gallons deliver fuel to the Installation. An estimated 50,000 gallons of Grade 1 fuel oil are stored in aboveground storage tanks, while more than 1,550,000 gallons of Grade 2 fuel oil are stored in onsite underground storage tanks. Grade 1 fuel oil can be stored above ground because it contains additives that prevent it from gelling in freezing temperatures.

3.12.2 Environmental Consequences

This section evaluates potential effects on utilities and public services from the Proposed Actions. Effects are evaluated based on the potential for the Proposed Actions to increase the demand on existing utilities and public services and/or create a new demand for utilities and public services. Utilities and public services evaluated in this section include energy (electricity and natural gas), water, wastewater, storm water, and telecommunications. Impacts would be considered significant if the Installation's needs exceed the ability of a utility or public service providers to supply required services.

3.12.2.1 Alternative 1 – No Action

Under the No Action Alternative, the RPMP Update would not be implemented and management at FLW would continue based on the existing Master Plan in place. Utility systems at FLW are the responsibility of the private owners and or operators, so all operations and maintenance activities are the sole responsibility of the utility providers. Although sufficient to meet the ongoing demand, utility facilities are deteriorating with age and are not equipped with upgraded technologies for better efficiency; however, they remain sufficient to meet current demand. Consequently, no impacts to utilities are anticipated under the No Action Alternative.

Overall, no impacts to utilities and services are anticipated under Alternative 1.

3.12.2.2 Impacts Common to Both Action Alternatives

Project components identified in the IDP, which include the Roadway Network Plan, Transit Network Plan, the Pedestrian and Bicycle Networks Plan, and Green Infrastructure Plan, would include the construction of additional infrastructure, including roads and paths. Construction could involve removing existing utilities and installing new site utilities that could include exterior lighting, walks, curbs, gutters, and storm drainage. Adding exterior lighting to accommodate roadways and paths would place additional demand on the electrical energy system. It is anticipated that this new demand would be inconsequential particularly compared to other demands placed on the system; however, because the current system is nearing maximum capacity, impacts would be long term and less than significant. In the event that a future light rail system is pursued, impacts to the electrical system could be more substantial, resulting in long-term, less than significant impacts. New sewer lines and storm drains installed to comply with the Green Infrastructure Plan would improve existing utilities and replace old and deteriorated infrastructure, resulting in long-term, beneficial impacts. Similarly, the addition of permeable surfaces could result in a reduction of impervious surface cover that could decrease storm water runoff quantity and increase storm water quality. Similarly, construction activities would require both electricity and could contribute to both water and wastewater. It is not anticipated that construction and associated activities would require substantial amounts of energy or would contribute greatly to water and wastewater particularly by following all applicable policies and implementing BMPs, resulting in short-term, less than significant impacts.

Implementation of the Utilities Framework Plan at FLW would address the infrastructure needs required to support the ongoing mission and would seek to pursue biofuels production, power generation via a power plant, central energy framework, ground source heat exchange and wind and solar energy.

Construction and construction activities would result in impacts as identified for the IDP in regard to the potential removal of existing utilities and installation of new site utilities and increased burdens on the electrical utility system and water and wastewater; however, based on the greater magnitude of construction activities, impacts are anticipated to be slightly more intense, but they would remain less than significant. The production of biofuels would not have a direct effect on utilities, so impacts are not anticipated. The operation of a power plant would result in long-term, beneficial impacts related to electrical energy generation because the power plant could work on alleviating issues with the current system nearing maximum capacity as well as providing an additional layer of energy independence and security, resulting in long-term, beneficial impacts. Similarly, albeit to a reduced extent the implementation of smaller scale wind and solar energy, central energy frameworks and ground source

heat exchange would result in impacts similar to those previously identified, resulting in long-term, beneficial impacts.

Construction of new facilities as part of Area Development Plans and the short-term projects noted in Table 2-4 would involve installing new utilities, such as electricity, gas, communications, sewer, and storm drainage. FLW would coordinate with utility companies and other relevant agencies before beginning construction to locate existing utilities, coordinate on new utilities, and provide notification of interruptions in services. Proposed future facilities and actions would follow the IDG, so resulting in reduced energy demands and greater efficiencies in regard to water and wastewater. Because new construction would be built to these standards, it is expected that energy demand would decrease or remain similar to existing conditions. Specific energy conservation measures will be finalized during the project design.

Renovations of existing buildings under the Capital Investment Strategy and short-term projects would not change demand on existing utilities. Some utility infrastructure would be replaced with new components, making facilities more efficient and reducing utility demands, resulting in long-term, beneficial impacts.

BMPs for conservation of energy, and water, would reduce the utility requirements for projects on an individual and cumulative basis. BMPs could include the following: (1) training in water conservation measures for domestic and construction use for staff and contractors; (2) providing adequate containers for recycling materials; and (3) the mandatory incorporation of recycling requirements for construction demolition debris into all contracts for outside construction, renovation, and demolition contractors. These elements could be carried forward as development continues according to the RPMP Update.

Overall, impacts to utilities and services as a result of actions common to both alternatives would be both beneficial as a result of renewable energy systems, the construction and operation of a power plant and high efficiency facilities as well as from the improvement of sewer lines and storm drains and adverse, but less than significant, from additional requirements of electrical systems.

3.12.2.3 Alternative 2 – Spine Roadway Option

The implementation of Alternative 2, the Spine Roadway Option, would include the construction of a major north-south transportation route. This roadway configuration could involve the removal of existing utilities and installation of new site utilities, including exterior lighting, walks, curbs, gutters, and storm drainage. The addition of exterior lighting to accommodate roadways and paths would place an additional demand on the electrical energy system. It is anticipated that this new demand would be negligible particularly compared to other demands placed on the system; however, because the current system is

nearing maximum capacity, impacts would be long term and less than significant. Similarly, additional roads could result in an increase of impervious surface cover that could increase storm water runoff quantity and decrease storm water quality. Similarly, construction activities would require electricity and could contribute to water consumption and wastewater. It is not anticipated that construction and associated activities would require substantial amounts of energy or would contribute greatly to water consumption and wastewater particularly by following all applicable policies and implementing BMPs, resulting in short-term, less than significant impacts.

Overall, impacts to utilities and services from Alternative 2, would be adverse, but less than significant, to electrical and stormwater from additional requirements on existing systems.

3.12.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Impacts under Alternative 3, the Loop Roadway Option, would be the same as those previously described for Alternative 2.

Overall, impacts to utilities and services from Alternative 3, would be adverse, but less than significant, on electrical and stormwater from additional requirements on existing systems.

3.13 Water Resources

Water resources are sources of water available for use by humans, flora, or fauna, including surface water, groundwater, nearshore waters, wetlands, and floodplains. Surface water resources, including but not limited to storm water, lakes, streams, rivers, and wetlands, are important for economic, ecological, recreational, and human health reasons. Groundwater is classified as any source of water beneath the ground surface and may be used for potable water, agricultural irrigation, and industrial applications.

3.13.1 Affected Environment

A variety of hydrologic features are found at FLW. Two major drainages transect the Installation. Big Piney River, a perennial river, flows through the Installation on the eastern side, and Roubidoux Creek, an intermittent creek, flows through the western side. Both water courses have high water quality (Class A according to the Missouri Water Quality Standards).

Several intermittent tributaries of these streams have their headwaters in the steep slopes surrounding the Main Cantonment, with one tributary flowing in a northeasterly direction from the outdoor recreation areas in the central portion of the Main Cantonment toward the Big Piney River. Nineteen well-defined stationary water bodies and numerous small springs, seeps, and sinkhole ponds are located on the Installation. Most streams contain springs that significantly augment the flow of surface water.

Sink holes, springs, losing streams, and caves created by the karst terrain connect surface water with and groundwater. A survey conducted by the U.S. Geological Survey recorded many indications of horizontal groundwater movement. Current Installation operations minimally affect groundwater and drinking water resources at FLW; however, nonpoint-source pollution resulting from destabilized impact areas (down range) and active construction areas (active) represents a significant threat to water quality at FLW. As shown on Figure 3-10, the majority of the Main Cantonment is located in the Dry Creek Watershed.

Wetlands are dispersed throughout FLW, but they are primarily associated with the Big Piney River and Roubidoux Creek. They are confined in extent to the riparian areas to the east and west of the Main Cantonment, and those in the training area in the southern portion of the Installation. Likewise, the floodplain does not extend into the Main Cantonment. Currently approximately 1,552 acres of potential jurisdictional wetlands exists at FLW (USACERL 1998). The largest sites occur in the Roubidoux Creek (848 acres), Big Piney River (530 acres), and Falls Hollow floodplains (30 acres). Collectively, these three drainages support 90 percent of the total wetland acreage identified at FLW. The official regulatory status of a wetland site will be determined on a case-by-case basis when siting new construction or other activities.

3.13.2 Environmental Consequences

3.13.2.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, the RPMP Update would not be implemented, and FLW would continue to manage the Installation based on the existing RPMP. Water resources as described in the Affected Environment section would remain unchanged. No activities with the potential to affect water resources would be conducted. Therefore, no impacts to water resources would occur.

Overall, the implementation of Alternative 1 would not result in impacts to water resources.

3.13.2.2 Impacts Common to Both Action Alternatives

Implementation of the Transit Network Plan includes a cantonment-wide bus system plan and a potential light rail system. The cantonment-wide bus system would occur within an existing footprint and would not affect water resources. It is assumed that the potential light rail system would follow existing bus lines. Construction of the light rail system could affect some water resources if construction were to occur near or within one of the riparian areas located within the Main Cantonment. Any impacts would likely be short term and less than significant. A future tiered NEPA evaluation process would be necessary prior to implementing the potential light rail system once feasibility has been determined.

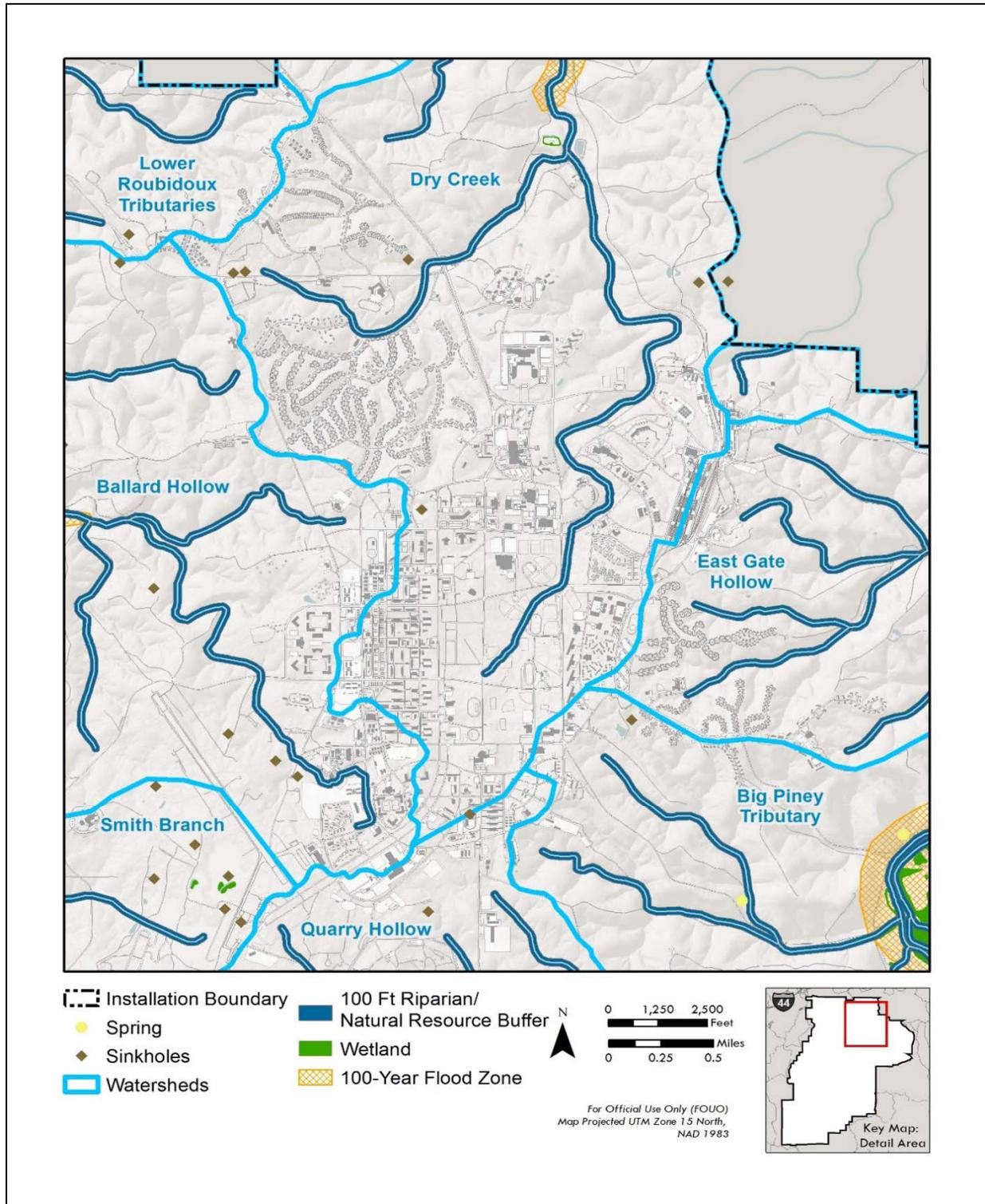


Figure 3-10. Water Resources at FLW

Implementation of the Pedestrian and Bicycle Networks Plan includes construction of sidewalks and bicycle paths. New sidewalk and bicycle path construction would present short-term, less than significant impacts to water resources through potential ground disturbance and runoff into those riparian areas within the Main Cantonment. Any impacts would likely be short term and not significant because they would occur within an existing infrastructure footprint. A future tiered NEPA evaluation process would be necessary to evaluate impacts at a site-specific level. The Green Infrastructure Plan may have adverse impacts to water resources from disturbance to riparian areas during construction and maintenance of the roadways. Overtime, green infrastructure will encourage pedestrian and bicycle activity, while lessening the load on high-maintenance gray infrastructure, which may lower the frequency and intensity of runoff and disruption.

Implementation of the Utilities Framework Plan includes potential use of river bottomland for oilseed crop production, potential power plant, and CHP plants. Converting river bottomland for oilseed crop production and increased use of water for agricultural process could affect water resources. Similarly, biofuels production could affect the water quality in the Roubidoux Creek and Big Piney Watersheds through soil disturbance and conventional farming methods. A future tiered NEPA evaluation process would be necessary to implement and evaluate using river bottomland for oilseed crop production and impacts to water resources and water quality once sites have been identified. Constructing a power plant or CHP plants could have short-term or permanent adverse impacts to water resources. Power plants often times require water for input and output during daily operation. A future tiered NEPA evaluation process will be undertaken if a power plant is to be constructed.

The land within the ADP districts and in the areas of the short-term projects (identified in Table 2-4) can be classified as significantly developed. Areas within the ADP districts that are developable are very close to existing infrastructure and associated foot print. The ADP districts are characterized by the everyday use of personnel and visitors on the Installation. Prior to development and upon more specific site selection, impacts would be evaluated in a future tiered NEPA evaluation process.

Overall, the implements of actions common to both alternatives would result in less than significant adverse impacts to water resources from construction and facility operation.

3.13.2.3 Alternative 2 – Spine Roadway Option

Alternative 2, the Spine Roadway Option, may have less than significant direct or indirect effects on water resources. These effects may include disturbance to riparian areas through construction and maintenance activities. The Spine Roadway Option could negatively affect water resources near or

adjacent to the major north-south transportation route or any associated areas from construction and increased traffic.

Overall, impacts to water resources under Alternative 2 are anticipated to be adverse, but less than significant, from construction activities.

3.13.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, could directly or indirectly affect water resources along the major north-south transportation route. These effects may include disruption to riparian areas or other water resources from construction or increased traffic. Under the Loop Roadway Option, construction activities and increased traffic after construction could affect water resources adjacent to Indiana and Nebraska Avenues.

Overall, impacts to water resources under Alternative 3 are anticipated to be adverse, but less than significant, from construction activities.

3.14 Transportation and Traffic

The ROI for transportation and traffic is limited to existing infrastructure and planned future infrastructure within the FLW boundaries.

3.14.1 Affected Environment

3.14.1.1 Off-Installation Transportation

Off-Installation Road Network

I-44 is 2 miles north of FLW, providing the primary transportation arterial for the Installation, connecting it to St. Louis to the northeast and ultimate destinations in Oklahoma and Texas to the southwest. I-44 runs northeast to southwest across the state, dominating the regional transportation network. The length of road between Springfield, Missouri, and St. Louis is part of historic Route 66. A spur from I-44 provides direct access to the Installation and to the city of St. Robert, directly adjacent to the northern boundary and Main Gate. Several secondary gates provide access to FLW from the east, northwest, and south.

State Highway 17 is located west of the Installation and runs essentially north and south across central Missouri. State Highway 28 located north of FLW begins at the eastern edge of St. Robert and runs northeast toward St. Louis to its termination at U.S. Highway 50 near Rosebud, Missouri (FLW 2014b).

In addition, a number of other state, county, and local roads within the region carry traffic between the various collector highways and from the collectors to the primary arterials. These roads include State

Highways 133, 7, E, H, J, M, T, U, and Y; County Roads L44-519, 17-519F, and AW-871; numerous named roads within Pulaski County and its incorporated cities and towns.

Regional Air Transportation

Located at FLW, Waynesville Regional Airport at the Forney Army Airfield is a regional airport that both the military and civilians use. The Waynesville Regional Airport at the Forney Army Airfield is currently in the planning process for an expansion that includes a new terminal building, an additional taxiway, a new parking lot, the relocation of a service road, and the potential addition of additional hangars (FLW 2015). Other airports in the region include Columbia Regional in Columbia, Missouri; Springfield-Branson Regional in Springfield, Missouri; Rolla National in Rolla, Missouri; Scott Air Force Base in O'Fallon, Illinois; and Whiteman Air Force Base east of Kansas City, Missouri (the designated mobilization aerial port for FLW).

Another small airfield, Babb Airfield, located southwest of Forney Army Airfield north of Range 36, consists only of an unpaved 1,200-foot assault strip and is not approved by the Federal Aviation Administration for serving air traffic. Use of this airfield is limited to military helicopter operations (U.S. Army 2006). The operation of air transportation infrastructure requires the use of restricted airspace; however, as described in Section 3.1.2, project components are not anticipated to affect this airspace at FLW and the surrounding area and as such detailed analysis is not included.

Off-Installation Rail Network

Burlington Northern Santa Fe Railway owns and operates the railroad lines that serve regional rail needs. When FLW began constructing the railroad line in 1940, a 14-mile spur was added to allow military trains carrying personnel and equipment direct access to the nationwide rail network.

Regional rail passenger service is limited to Amtrak with primary stations in Kansas City, Jefferson City, and St. Louis, Missouri. Additional stops are made between these cities in Washington and Hermann. Jefferson City is the closest station to FLW.

Off-Installation Intercity Bus Network

FLW has an intercity bus station in St. Robert; the closest intercity transfer/ terminal station is in Rolla.

On-Installation Transportation

Access Control Points

Primary access to FLW is from I-44 on the north by Business Spur I-44 (Missouri Avenue), a four-lane divided arterial roadway that provides a direct connection to the Sverdrup Gate (Main Gate). This gate has a multiple-lane checkpoint with a visitor center.

Secondary gates provide access to the Installation on the east (from State Highway J onto Eastgate Road), on the northwest (from State Highway H onto Polla Road), and on the south (State Highway onto FLW Route 1). These gates are primarily for the military and civilian personnel, dependents, and/or retirees with appropriate identification. Security personnel monitor each of these access control points, which vary in alert status based on the federal threat level.

The commuter peak periods through these gates are approximately 0730–0900 (inbound) and 1600–1730 (outbound). During these periods, queuing and congestion are present at the Main Gate. According to the IDP, Installation employees indicated that morning backups at the West Gate are perceived to be worsening.

Circulation Network

The Installation has more than 284 miles of roads, including 100 miles of paved roads, 55 miles of loose surface roads, and 129 miles of improved and unimproved dirt roads.

In the range and training areas, roads are generally unpaved and intended for government vehicle use only. Signs are posted to instruct drivers when or if privately owned vehicles may be used. Range roads are open year-round and available for light force vehicles. Some support tracked vehicle movement within the range parameters. Access to the range areas from the Main Cantonment is provided by a connecting trail from the west range area to the primary maintenance facilities directly east of Indiana Avenue at Kansas Avenue.

In the Main Cantonment, internal transportation is provided by a network of roads primarily laid out in a grid pattern. All roadways within the Main Cantonment are paved, two-way, and two lanes wide, except Missouri Avenue, which is four lanes wide with a dividing median beginning north of its intersection with 1st Street. Traffic flow within the Main Cantonment is predominantly north/south along the primary roadways of Missouri Avenue, Iowa Avenue, and Nebraska Avenue. The Installation lacks a primary north-south route to accommodate major thru-traffic and reduce conflicts with pedestrians and local traffic. Major east/west primary roadways include 1st Street and South Dakota and North Dakota Avenues.

Traffic within the Installation is mostly controlled by stop signs. A few signalized intersections occur at primary locations on Missouri Avenue, Oklahoma Avenue, Constitution Avenue and Indiana Avenue. Several signalized crosswalks, especially within the Family housing areas, are available to allow school children to safely cross the street.

Although the Main Gate is the primary access control point for the Installation, West Gate also has considerable traffic. Vehicles queue on internal roadways interior to both access control points during

rush hours. Weekly graduation ceremonies also contribute to the traffic congestion on the Installation. Visitors travel from the Main Gate to graduation venues in and around the BCT/OSUT (Area 2), AIT South (Area 4), AIT East (Area 7), and visit destinations nearby. The museum and post exchange/commissary areas are the most popular destinations during graduations.

Per the IDP, two primary vehicular traffic flows were identified by Installation personnel:

- Traffic from the West Gate to the range lands. This route goes through the BCT/OSUT (Area 2) where trainees' outdoor physical training and troop marches often block or slow traffic on certain roadways in the morning. Conflicts at pedestrian crossings along Indiana Avenue have been exacerbated by the construction of the two BCT complexes west of the road. The truck and trailer transportation of trainees from the BCT/OSUT to the ranges and training lands also add to the traffic conflicts and congestion.
- Southbound traffic from the Main Gate down Missouri Avenue to the range complex. Daily peak-hour congestion usually dissipates beyond the hospital (Area 9); however, congestion along this route is especially an issue during weekly graduation ceremonies, when visitors park along both sides of Iowa Ave and visit nearby destinations. Stop signs have been added along Iowa Avenue, resulting in some traffic moving onto Constitution Avenue where cars may travel unimpeded between Replacement Drive and South Dakota Avenue.

Truck and heavy vehicle traffic often creates conflicts with personnel traffic on the Installation. The need to move trainees between the Main Cantonment and ranges is estimated to generate 2.4 million trips annually, at a cost of \$2.6 million. Between the ranges and TACOM motorpool south of the Main Cantonment (generally to the Training Area-244 area), this issue is of particular concern. Improvements to the circulation system and to the facility functional relationships are becoming increasingly necessary to alleviate congestion and improve traffic flow.

At FLW, sidewalks and pathways are provided along major streets and between buildings. Most sidewalks and pathways exist in the BCT (Area 2), AIT areas (Area 4 and Area 7), and Residential Communities Initiative Program housing areas. Wide sidewalks are established along some roadways to accommodate physical training and troop marches. Conflicts between pedestrians and vehicles are an issue of the transportation network, particularly in the BCT and AIT areas. Different land use parcels are not well connected to each other by walkways. To create a cohesive and interconnected pedestrian network, a consistent, connected, and functional pedestrian circulation plan will be needed for the Installation.

FLW does not have dedicated bicycle lanes. Bicycle activity is minimal because of a heavy reliance on cars for transportation to and from the Installation, limited locker and shower facilities, hilly terrain, and variable seasonal weather.

FLW's lack of safe, connected, non-automobile modes of transportation between the residential areas and the community support areas is one reason for the limited pedestrian and bike activity. Because of the suburban, auto-oriented pattern of Family housing at FLW, it is anticipated that most trips between the residential areas and community support destinations would continue to be car trips.

Rail Network

Rail service for FLW is provided by a government-owned railroad that connects to the Burlington Northern Santa Fe-owned national rail system approximately 2 miles east of Jerome, Missouri, in Phelps County. The rail system on the Installation consists of 27.84 miles of track with most spur lines within the main warehouse area west of Minnesota Avenue and south of 1st Street. This rail system is used for the receipt of material and equipment and the shipping of vehicles and equipment to FLW's point of debarkation during deployments or training exercises. Within the Installation boundary, the rail system is operated by the Transportation Division, DOL. Any (non-rail oriented) southward expansion or development would position vehicles and equipment requiring rail offloading farther from the rail system. As a result, without modification or extension, the existing system could become a constraint to future development.

3.14.2 Environmental Consequences

3.14.2.1 Alternative 1 – No Action

Under the No Action Alternative, current transportation-related issues, including traffic congestion during rush hour and graduation ceremonies, conflicts between pedestrians and vehicles, and routes being blocked by heavy training vehicles, would persist and could potentially worsen with an increase in personnel or a temporary increase in Installation's population due to construction projects that would occur on an informal basis. However, the worst congestion on the Installation currently receives an LOS score of B and, as such, could withstand a substantial increase in daily traffic prior to falling to an LOS of E or F with impacts under Alternative 1 being adverse, but less than significant.

Overall, impacts to traffic and transportation under Alternative 1 would be adverse, but less than significant, because of continued, current congestion.

3.14.2.2 Impacts Common to Both Action Alternatives

Construction activities associated with the Roadway Network Plan, Transit Network Plan, Pedestrian and Bicycle Networks Plan, Area Development Plans, and the Capital Investment Strategy and identified short-term projects could potentially increase traffic congestion as a result of construction worker trips and materials delivery and could result in road closures in delays. It is anticipated that the overall increase in traffic and potential road closures would be relatively small in nature when compared to existing traffic and existing infrastructure, so adverse impacts would be short term and less than significant.

Both Action Alternatives include the implementation of a Roadway Network Plan, a Transit Network Plan, and a Pedestrian and Bicycle Networks Plan. The implementation of these plans would increase the amount of mobility options for both Soldiers and civilians on the Installation and would address current issues of congestion, heavy vehicle conflicts, lack of walkability and transportation alternatives, and the need for stronger connections between primary destinations, resulting in overall beneficial impacts to traffic and transportation.

The Transit Network Plan involves the potential implementation of a light rail system, dependent on the outcome of a feasibility study and a future tiered NEPA evaluation process. If implemented, the construction of a light rail could have short-term impacts on roadway congestion and level of service resulting from closures and additional vehicles from associated construction personnel, resulting in short-term, less than significant impacts. The long-term effects have the potential to lower recurring congestion and overall personal vehicle use during daily operation, resulting in a less immediate need for roadway investments, such as widening, traffic signal improvements, and other traffic mitigation measures, all of which would result in overall beneficial impacts. Future development around the light rail system will consist of transit-oriented, compact mixed-use development that promote walkable, livable communities. Similarly, the Pedestrian and Bicycle Networks Plan would help to alleviate recurring congestion. As people are given more mobility options, overall car trips tend to decline because people opt to walk and bike for short trips and use transit for longer trips, resulting in beneficial impacts.

Overall, impacts to traffic and transportation as a result of actions common to both alternatives would be both beneficial from reduced congestion, increased connectivity, transit options and walkability to adverse, but less than significant, from construction related road closures and delays.

3.14.2.3 Alternative 2 – Spine Roadway Option

Alternative 2, the Spine Roadway Option, funnels traffic onto a spine through the middle of the Installation from which collector roads would branch out to local roads. The spine would provide a direct route between the range area and the Main Gate, concentrating traffic along Constitution Avenue and

bisecting downtown (Area 1). It would also act to draw traffic away from potential pedestrian conflicts in the BCT and AIT areas (Areas 2, 4, and 7), resulting in long-term, beneficial impacts. The Spine Roadway Option would require the construction of an additional 1,800 feet of major roadway to connect Constitution Avenue with Iowa Avenue. Construction would occur in the areas just north and south of South Dakota Avenue, near the Abram's Theater and the FLW Police Department. The crew and materials needed to build this addition would be minimal, and this option would result in short-term, less than significant impacts on traffic flow as a result of construction-related delays and closures.

Constitution Avenue currently sees volumes of approximately 4,000 vehicles per day, based on four 24-hour periods between 2 February 2012 and 6 February 2012. It is a two lane north-south arterial with 12-foot-wide lanes and 10-foot-wide paved shoulders. While data related to the level of congestion and the peak hour usage are limited, it can be assumed that Constitution Avenue would receive a better level of service score (LOS B) than Nebraska Avenue (see Alternative 3). It would most likely receive a score of LOS A because it is an adjacent north-south arterial with half the daily traffic volume and similar roadway attributes to Nebraska Avenue. The additional traffic volume from the realignment, which would make it a more convenient north-south route, would most likely not cause the level of service to drop to a failing score of LOS E or LOS F, meaning that no traffic mitigation would be required; however, a more detailed traffic study would need to be conducted to measure current congestion levels and make that official determination.

Overall, impacts to traffic and transportation under Alternative 2 would be beneficial from reduced congestion and pedestrian conflicts and adverse, but less than significant, from construction-related road closures and delays.

3.14.2.4 Alternative 3 – Loop Roadway Option (Preferred Alternative)

Alternative 3, the Loop Roadway Option, would involve the creation of an arterial loop that would serve to pull away traffic from Constitution Ave and re-route it to Nebraska Avenue and Indiana Avenue. It would divert traffic away from the central pedestrian area and allow for greater multi-modal options with fewer potential pedestrian conflicts, resulting in long-term, beneficial impacts. This alternative would require the construction of 3,605 feet of new principal arterial, 3,852 feet of new principal collector, and 3,521 feet of new local roadway. Construction of this option may cause non-recurring congestion resulting from closures along North Dakota Avenue, which acts as a major connector between nonaligned north-south roadways.

One of the areas of recurring congestion addressed under this alternative is Missouri Avenue. According to Installation personnel, Missouri Avenue already experiences congestion in the southbound direction

between the Main Gate and the hospital (Area 9), especially during weekly graduation ceremonies. This bottleneck would be addressed by re-routing traffic from Missouri Avenue, through 1st Street and down Nebraska Avenue.

Because of the re-route, this alternative could potentially cause increased levels of congestion along Nebraska Avenue, which is already a busy primary north-south road on the Installation. Nebraska Avenue is a two-lane road with 12-foot-wide lanes and 10-foot-wide paved shoulders. It was analyzed between Kansas Avenue and Minnesota Avenue, running east of Colyer Park. Data were collected over four 24-hour periods between 10 February 2012 and 14 February 2012. The average daily volume in the southbound direction during this period was 3,604 vehicles. Assuming that similar volume would occur in the northbound direction, this road sees an average of 7,208 vehicles per day. The largest peak period ran in the morning between the hours of 0500 and 0800. An additional peak period occurred at noon and the majority of traffic eased in the afternoon and into the evening (Figure 3-11).

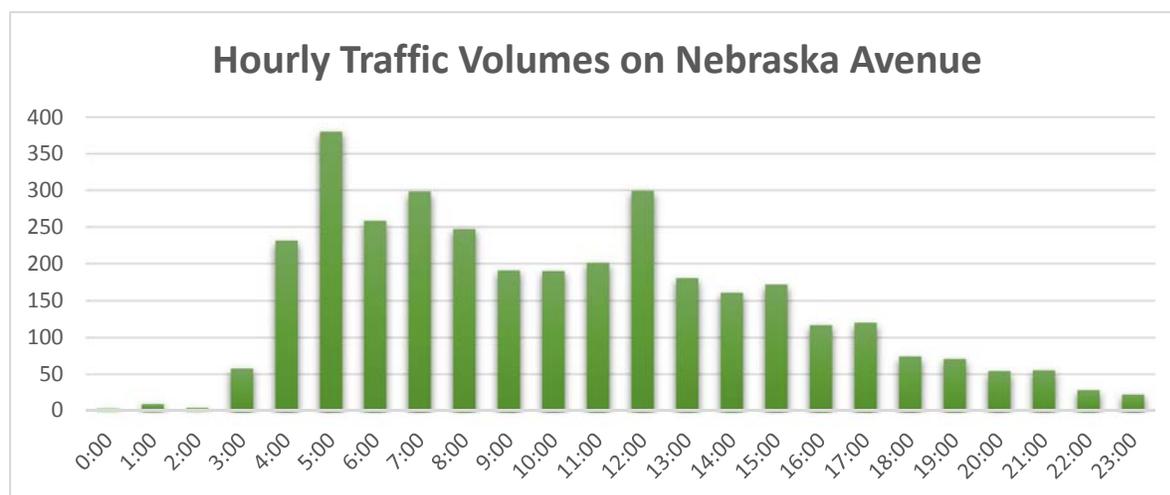


Figure 3-11. Hourly Traffic Volumes on Nebraska Avenue

The largest hourly volume was 380 vehicles in the southbound direction from 0500 to 0600 on 13 February 2012. Given these factors, this section of Nebraska Avenue would receive a score of LOS B, based on traffic density during its busiest period. Another factor that can be used to determine congestion includes observed speeds during peak periods. The observed-to-posted speed ratio is equal to the average observed speed divided by the posted speed limit. A road segment with an observed-to-posted speed ratio of 50 percent or less is considered to be congestion. Nebraska Avenue had an observed-to-posted speed ratio of 83 percent for the AM peak period (0500 to 0800). Based on both of these factors, this section of the roadway is not congested and maintains a passing level of service score. While Nebraska Avenue is currently not congested, increased traffic due to its designation as a minor arterial under the Loop

Roadway Alternative could create a lower overall level of service score and would require traffic mitigation measures.

The other major roadway affected under this alternative is Indiana Avenue, which is a two-lane road with 12-foot-wide lanes and maintains a 5-foot wide shoulder in most areas. Data were insufficient to determine the current level of service of Indiana Avenue. The roadway experienced an average daily volume of 1,600 between 7 March 2012 and 12 March 2012. Given that the roadway has similar characteristics as Nebraska Avenue and experiences a quarter of the daily traffic, it could withstand a substantial daily increase in traffic before falling to LOS E or LOS F. While future traffic studies will have to be conducted to determine the official level of service, the roadway would foreseeably require no mitigation because it has enough capacity to serve current and future demand, resulting in long-term, less than significant impacts.

Overall, impacts to traffic and transportation under Alternative 2 would be beneficial from reduced pedestrian conflicts and adverse, but less than significant, from construction-related road closures and delays and potential increases in traffic congestion.

3.15 Summary of Environmental Impacts

Table 3-12 provides a summary of impacts by resource area for the No Action Alternative and the Proposed Actions.

Table 3-6. Summary of the Impacts of the Proposed Actions

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Air Quality	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Beneficial impacts from reduced emissions resulting from a transition to more efficient vehicles, potential reduction in vehicle trips, and additional vegetated and riparian areas. Less than significant impacts from short-term construction emissions and additional building facilities. Less than significant to potentially significant but mitigable impacts from power plant construction and operational emissions.	Potential beneficial impacts resulting from reduced congestion. Less than significant impacts from short-term construction emissions.	Potential beneficial impacts resulting from reduced congestion. Less than significant impacts from short-term construction emissions.

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Biological Resources	No impacts.	Less than significant impacts to vegetation, wildlife, and sensitive species resulting from construction-related ground disturbance and noise, construction of future facility footprints, and potential operation of wind turbines.	Less than significant impacts to wildlife and sensitive species resulting from construction-related ground disturbance and noise.	Less than significant impacts to vegetation, wildlife, and sensitive species resulting from construction-related ground disturbance and noise
Cultural Resources	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Potential beneficial impacts resulting from less vehicle traffic. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.	Beneficial impacts resulting from vehicle reductions. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.	Beneficial impacts resulting from vehicle reductions. Less than significant impacts to cultural resources resulting from construction-related ground disturbance, road operation, and facility construction and demolition. Significant but mitigable impacts from implementation of the Area Development Plans and particularly the demolition of the Rolling Pin Barracks Historic District. Section 106 process would be completed prior to construction.
Energy	No impacts.	Beneficial impacts to energy generation resulting from increased renewable energy generation and to energy security from greater energy generation on the Installation. Beneficial impacts resulting from vehicle reductions and energy efficient facilities. Less than significant impacts as a result of transit associated with oil seed cropland.	Potential, less than significant, indirect impacts as a result of increased travel.	Potential, less than significant, indirect impacts as a result of increased travel.
Facilities	Less than significant impacts from the informal construction of facilities at FLW inside the framework of the existing RPMP.	Beneficial impacts to facilities as a result of increased efficiencies, sustainability, connectivity, safety, and energy security. Beneficial impacts from addressing of facility deficits and excesses.	No impacts.	No impacts.
Geology and Soils	Less than significant impacts to soils from the informal construction of facilities at FLW inside the framework of the existing RPMP. No impacts to geologic features.	Beneficial impacts to soils and soil productivity resulting from the naturalization of the floodplain and the planting of native vegetation. Less than significant impacts to soils from ground disturbance. No impacts to geologic features.	Less than significant impacts to soils from ground disturbance. No impacts to geologic features.	Less than significant impacts to soils from ground disturbance. No impacts to geologic features.

Resource	Alternative 1: No Action	Impacts Common to Both Action Alternatives	Alternative 2: Spine Roadway Option	Alternative 3: Loop Roadway Option
Hazardous Waste, Hazardous Materials, and Safety	Beneficial impacts to human health and safety from the removal of asbestos and/or lead paint. Less than significant impacts from the potential for petroleum leaks from construction equipment.	Beneficial impacts to human health and safety through the identification, removal, and remediation of hazardous substances. Less than significant impacts from the potential of petroleum leaks from construction equipment.	Less than significant impacts to human health and safety from the potential for leaks of petroleum products related to the construction and operation of infrastructure.	Less than significant impacts to human health and safety from the potential for leaks of petroleum products related to the construction and operation of infrastructure.
Land Use	Less than significant impacts from continued operational deficiencies.	Beneficial impacts to land use from increased connectivity and land use compatibility.	Beneficial impacts to land use from increased connectivity.	Beneficial impacts to land use from increased connectivity.
Noise	Less than significant impacts from noise during informal construction of facilities.	Beneficial impacts from reductions in transportation-related noise sources. Less than significant impacts from noise during construction and potential, less than significant impacts from light rail and facility operations.	Less than significant impacts from noise during construction and operation.	Less than significant impacts from noise during construction and operation under each alternative.
Socioeconomics and Environmental Justice	Beneficial impacts to economic growth associated with the procurement of goods and services.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction and potentially operation.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction.	Beneficial impacts to economic growth associated with the procurement of goods and services during construction.
Utilities and Services	No impacts.	Beneficial impacts resulting from installing new sewer lines and storm drains operating a power plant and renewable energy systems. Beneficial impacts from the construction and operation of high-efficiency facilities. Less than significant impacts to electrical utilities from additional requirements on existing systems as well as from construction requirements.	Less than significant impacts to electrical utilities and storm water systems from additional requirements on existing systems and construction requirements.	Less than significant impacts to electrical utilities and storm water associations from additional requirements on existing systems and construction requirements.
Water Resources	No Impacts.	Less than significant impacts to surface, groundwater, and riparian areas from construction and facility operation.	Less than significant impacts to surface, groundwater, and riparian areas from construction.	Less than significant impacts to surface, groundwater, and riparian areas from construction.
Transportation and Traffic	Less than significant impacts from the continuation of current congestion.	Beneficial impacts resulting from reduced congestion and increased connectivity, transit options, and walkability. Less than significant impacts from construction-related road closures and delays.	Beneficial impacts resulting from reduced congestion and pedestrian conflicts. Less than significant impacts from construction-related road closures and delays.	Beneficial impacts resulting from reduced pedestrian conflicts. Less than significant impacts from construction-related road closures and delays and from potential increases in traffic congestion.

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4.0 CUMULATIVE IMPACTS METHODOLOGY

In addition to identifying the direct and indirect environmental impacts of their actions, the CEQ's NEPA regulations require federal agencies to address cumulative impacts related to their proposals. A cumulative impact is defined in the CEQ regulations (40 CFR §1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." This section describes the process used to identify potential cumulative impacts related to the Proposed Actions at FLW and discusses those impacts for each of the resources addressed in Chapter 3.

4.1 Process for Identification of Cumulative Impacts

CEQ has published guidance for assessing cumulative impacts in *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997b). In summary, the process outlined by CEQ includes identifying significant cumulative effects issues, establishing the relevant geographic and temporal (time frame) extent of the cumulative effects analysis, identifying other actions affecting the resources of concern, establishing the cause-and-effect relationship between the Proposed Actions and the cumulative impacts, determining the magnitude and significance of the cumulative effects, and identifying ways in which FLW's proposal might be modified to avoid, minimize, or mitigate significant cumulative impacts.

Issues to be addressed in this cumulative impacts analysis were determined based on the identification of resources that would be affected by the alternatives under evaluation. These resources were identified based on the analysis of direct and indirect effects that have the potential to combine with other past, present, or reasonably foreseeable future actions to produce a larger impact. If the analysis demonstrated a resource would not be directly or indirectly affected, it was not included in the cumulative impacts analysis because the Proposed Actions would not add to cumulative impacts.

The geographic extent of the cumulative impacts analysis generally coincides with the ROI of each resource. The CEQ regulations specify that cumulative impacts analyses encompass past, present, and reasonably foreseeable future actions. As a practical matter, the impacts of past actions are already reflected in the conditions that currently exist, as described in the affected environment in this chapter. Where appropriate and feasible, those sections note past activities that may have cumulatively contributed to the current condition of the environment. Past, present, and reasonably foreseeable future actions considered in the analysis are identified here. In general, this PEA considered present and reasonably

foreseeable future actions as those that are under construction, are the subject of a plan or proposal, or have identified funding. Actions beyond that become increasingly speculative and difficult to assess.

4.2 Identified Past, Present, and Reasonably Foreseeable Future Actions

The following past, present, and reasonably foreseeable future actions were considered as part of this cumulative impacts analysis.

4.2.1 Past Actions

Fort Leonard Wood: Initial Integrated Strategic Sustainability Plan

The ISSP was developed to ensure that FLW can preserve existing environmental and facility resources to allow FLW to continue to meet mission requirements in the future. The plan identifies six strategic sustainability goals that align with FLW's six core business areas, which work in guiding FLW to meet its strategic mission. The goals include:

- Goal 1: Ensure that the sustainable natural and built infrastructure meet the current and future mission
- Goal 2: Ensure that timely, efficient mission services exceed the standard and support a dynamic training and readiness environment
- Goal 3: Be a fully engaged community partner
- Goal 4: Keep Service Members, Families, and civilians resilient in mind, body, and spirit
- Goal 5: Maintain a culture of pride and trust throughout the FLW workforce
- Goal 6: Provide modern, adaptable and high-performance training facilities, ranges, land, and airspace

USACE 2030 Integration Project: Integrated Living Community (FLW)

USACE's Integration of Energy/Sustainable Practices into Standard Designs focused on utility reduction improvements and design modifications for selected standard design types. The purpose was to "investigate building features and construction methods and materials to optimize the selected standard designs with regard to energy reduction and sustainability and at a minimum ensure that the selected standard designs meet all applicable energy reduction and sustainable design policy."

U.S. Army Fort Leonard Wood Garrison Campaign Plan 2011–2017

The FLW Garrison Campaign Plan represents the FLW Garrison Commander's vision and plan for the Installation to bring effective and efficient services, programs, and infrastructure to bear on the challenges

faced by Commanders, Service Members, Families, and civilians in a fluid operating environment. It lays out an overall strategy through six LOEs, keys to success, and metrics to track progress.

FLW Range Complex Master Plan

The FLW RCMP outlines the range, maneuver, and testing land requirements needed at FLW to support the Installation training and testing missions and notes how range facilities and training areas are to be managed in a manner similar to the RPMP Update for the Main Cantonment. It provides a view of the available training assets, identifies the users (customers), and establishes the training requirements based on Army training doctrine and resource guidance. This Master Plan presents the overall development strategy for FLW; therefore, it may incorporate relocations of training functions based on feedback from FLW.

Comprehensive Energy and Water Master Plan (2011)

This study evaluated the energy and water uses at the Installation and proposed action plans and future focus, including short- and long-range improvements that would reduce energy and water consumption to meet federal mandates. Based on the study, up to 19.4 percent energy reduction can be achieved by upgrading aged, inefficient systems and equipment (compared to FY 2003 baseline). The Institution of the Energy Awareness Campaign can provide an additional 10 percent energy savings, and replacing or improving deficient structures will result in another 3 percent reduction. The study also looked at the overall renewable energy opportunities at FLW. At the time of the existing RPMP, the return on investment analysis of renewable energy projects is challenging with the relatively low cost of electricity. However, current electricity prices in the area are rising, and FLW power requirements likely will soon exceed the level of capability of the currently used electrical supplier, potentially resulting in FLW seeking additional power opportunities.

4.2.2 Present and Reasonably Foreseeable Future Actions

The following actions are ongoing or are considered reasonably foreseeable future actions.

Supplemental Programmatic Environmental Assessment for Army 2020 Force Structure Realignment

A Supplemental PEA was completed in 2014 that considered the environmental effects on installations that could result from the realignment of Army forces from FY 2013 through FY 2020. The 2014 Supplemental PEA was prepared as a supplemental NEPA evaluation to the Army's 2013 PEA because of changes to the Purpose and Need described in the 2013 PEA. The Proposed Action is to conduct force reductions and force realignments to a size and configuration that was capable of meeting national security and defense objectives. Force reductions and realignments were analyzed at 30 installations,

including FLW. Potential population loss analyzed as a result of reductions and realignments at FLW in the Supplemental PEA was 5,400. The majority of impacts at FLW were considered negligible or minor; however, significant impacts were identified for socioeconomics and beneficial impacts were identified for air quality, energy demand and generation and traffic and transportation.

4.3 Cumulative Impacts to Resource Areas

4.3.1 Air Quality

Past actions such as the sustainability and energy conservation planning efforts would have beneficial impacts on air quality. Reduced fuel consumption resulting from energy conservation or renewable energy initiatives would in turn reduce emissions of criteria pollutants and GHG emissions. Similarly, potential force reductions from Army 2020 Force Structure Realignment would have beneficial effects on air quality. Detailed information on the FLW RCMP is not available, but the plan is not expected to result in a substantial increase in emissions from trainings and munitions activity over current levels. Therefore, cumulative impacts from the combination of past and present activities and the Proposed Actions would be less than significant.

4.3.2 Biological Resources

The Proposed Actions would have less than significant impacts on biological resources depending on site selection of and locations for biofuel production. Actions that permanently convert habitat to agricultural could be mitigated once sites are chosen. Any impacts from roadway, pedestrian trail, and infrastructure construction and updates would either be less than significant or significant but mitigatable. Therefore, cumulative effects on biological resources would be less than significant.

4.3.3 Cultural Resources

With the exception of the effects from implementing the Area Development Plans, the Proposed Actions are anticipated to have less than significant impacts on cultural resources. The 2014 Supplemental PEA did not call for the demolition of any historic structures and would ensure that adequate staff will be maintained to manage cultural resources at FLW. Other past, present and reasonably foreseeable projects considered for this analysis would have or would result in the removal of historic buildings. To date six historic buildings have been demolished, two by a tornado, and two have been privatized. World War II-era stonework has also been demolished or altered, while other stonework sites are in a state of neglect. Implementing the Area Development Plans would result in the demolition of most or all of the Rolling Pin Barracks, a total of 23 historic buildings; removal of half of the remaining historic structures, and additional potential impacts to the stonework in areas that have already been affected. This action, combined with previous demolition of historic structures and stonework, would result in negative

cumulative impacts to cultural resources. These cumulative impacts are anticipated to be significant but mitigable.

4.3.4 Energy

The proposed substations and the plans under the IDP would have a less than significant impact on energy for the Installation. The Proposed Actions would increase energy efficiency, offsetting energy impacts due to Installation expansion and new development associated with the FLW RMP. Additionally, the Comprehensive Energy and Water Master Plan (2011) proposes measures that would increase energy efficiency over time, but due to the current low cost for electricity, the return on investment may be negligible.

4.3.5 Facilities

The Proposed Actions would result in long-term, beneficial impacts to facilities as a result of increased efficiencies, security, connectivity and sustainability. When combined with the similar long-term, beneficial impacts from the past actions, including the USACE 2030 Integration Project: Integrated Living Community and FLW: ISSP, overall cumulative impacts to facilities would be long term and beneficial.

4.3.6 Geology and Soils

Cumulative impacts to soils and geology occurring under the Proposed Actions combined with force reductions and realignments analyzed in the 2014 Supplemental PEA would be less than significant. The construction of new barracks or buildings would result in short-term impacts to soils but would not result in substantial degradation of soils, soil fertility, soil productivity, or geologic resources.

4.3.7 Hazardous Materials, Hazardous Waste, and Safety

Under the Proposed Actions, FLW would minimize the use of hazardous materials during the construction of new facilities and infrastructure. Proper hazardous materials handling, worker safety precautions, and appropriate waste management practices would be implemented. FLW would recycle or reuse construction, renovation, and demolition waste to the fullest extent possible and would properly dispose of remaining waste. Therefore, hazardous materials and hazardous waste would have a less than significant impact on human health and safety. Some beneficial impacts could occur from removing hazardous materials in existing facilities. Cumulative effects from hazardous, toxic, and radioactive waste would occur resulting from disposal of construction materials, including asbestos containing materials from demolition projects at FLW under the RPMP Update, and when combined with other projects with similar construction materials disposal needs, including the FLW RCMP through range modernization and upgrade potential, adverse impacts could occur. With the implementation of necessary regulations,

the Proposed Actions are not expected to result in any significant cumulative effects on safety from hazardous materials or hazardous waste.

4.3.8 Land Use

Future planned projects at FLW under the RPMP Update would comply with land use guidelines for the federal property. All proposed projects would follow land use designations as defined within Army Regulation 210-20, *Real Property Master Planning for Army Installations*, as well as all neighboring land uses and applicable FLW regulations. No cumulative effects on land use would occur because Army land use designations would not change and no action would cause neighboring land uses to change.

4.3.9 Noise

The Proposed Actions combined with force reductions and realignments analyzed in the 2014 Supplemental PEA would have less than significant, cumulative impacts from noise at the Installation. While noise is expected to increase as a result of cumulative construction projects, it is not expected that these combined actions would result in noise levels that exceed the compatibility standards for noise zones at FLW or would produce occupational noise levels that exceed 85 dB for an 8-hour day.

4.3.10 Socioeconomics and Environmental Justice

Past actions at FLW included a number of plans that would likely have resulted in beneficial, short- and long-term impacts to employment, income, and sales in the ROI as a result of construction projects under these plans. In addition, FLW's Comprehensive Energy and Water Master Plan likely has resulted in energy usage reductions on the Installation. It is possible that as the Installation has reduced, and continues to reduce, its energy consumption that this could result in a long-term, adverse impact to employment at the energy production utility from which FLW purchases its energy. Because sufficient information is not available to determine whether this energy use reduction has caused a change in employment at the utility provider, impacts from these energy savings are unknown. There would be no other socioeconomic impacts from past projects. No evidence is available to indicate that there would be any environmental justice impacts or impacts to children as a result of any of the past actions. Because no impacts from any of the Action Alternatives are anticipated to result in significant impacts to any socioeconomic resources, cumulative impacts from the combination of past activities along with the impacts from the Proposed Actions would likely result in beneficial impacts to sales, income, employment, and housing. Cumulative impacts to population, schools, and government and emergency services would also occur. A future tiered NEPA evaluation of impacts from projects under the Action Alternatives is required to determine the specific impacts to socioeconomic resources. Because past actions would not result in environmental justice impacts or impacts to children, Alternatives 2 and 3

under the Proposed Actions would not result in any environmental justice impacts, and Alternative 3 would not result in impacts to children, no cumulative environmental justice impacts or impacts to children are anticipated. A future tiered NEPA evaluation process is required to determine whether impacts to children under Alternative 2 would occur. Until this NEPA evaluation is completed, it is not possible to determine whether cumulative impacts to children would occur under this alternative.

The only present and future project identified is the 2014 Supplemental PEA for Army 2020 Force Structure Realignment. This realignment is expected to have significant, adverse impacts to some schools on both the Installation and the ROI. Impacts to housing under this project are expected to range from less than significant to significant, depending on the reduction in median housing values in the ROI under this action. Impacts to government and emergency services, such as medical services, are also expected to be significant, while less than significant impacts to employment, income, sales and population would occur under this project. Because no impact from the Action Alternatives is anticipated to be result in significant impacts to any socioeconomic resources, cumulative impacts from the combination of present and future activities along with the impacts from the Proposed Actions would likely result in beneficial impacts to sales, income, and employment. Cumulative impacts from the combination of present and future activities along with the impacts from the Proposed Actions would likely result in significant impacts to housing, government and emergency services, and schools. Because no environmental justice impacts or impacts to children would result under the Supplemental PEA for Army 2020 Force Structure Realignment, Alternatives 2 and 3 would not result in any environmental justice impacts, and Alternative 3 would not result in impacts to children, no cumulative environmental justice impacts or impacts to children would occur. A future tiered NEPA evaluation process is required to determine whether children would be affected under Alternative 2. Until this is completed, it is not possible to determine whether cumulative impacts to children would occur when the impacts under the Supplemental PEA for Army 2020 Force Structure Realignment are combined with Alternative 2.

4.3.11 Utilities and Services

Public utilities include electrical, natural gas, water, sewer, wastewater, storm water drainage, and telephone services. The cumulative impact analysis considered the net effects of the Proposed Actions on the capability of local public service and utility providers to meet the cumulative demand for service. The construction of new barracks or buildings would likely result in more energy efficient buildings because the projects would use modern, energy efficient materials.

The cumulative impacts on utilities, such as electrical, sewer, and telephone services, would be less than significant under the Proposed Actions. While demand would be expected to increase as a result of

cumulative construction projects and could place an additional demand on utility systems, it is not expected that these actions would exceed the available utility capacity.

4.3.12 Water Resources

The Proposed Actions would have a short-term, less than significant impact on water resources. Construction activities and production of biofuel may temporarily affect water resources close to the specific projects, but impacts would be less than significant. Overall, cumulative effects on water resources would be less than significant for the Installation.

4.3.13 Transportation and Traffic

The proposed roadway network alternatives present in the FLW RPMP Update would address the current issues of congestion, heavy vehicle conflicts, and lack of walkability. The plan focuses on providing a greater range of transportation alternatives and on fostering stronger connections between primary destinations. Both of these strategies would result in beneficial impacts for users of all modes of transportation. Additionally the implementation of the Transit Network Plan and the Pedestrian and Bicycle Networks Plan would increase the amount of mobility options for both Soldiers and civilians on the Installation and would also help to address issues of congestion. The reasonably foreseeable construction related to current plans of new facilities and infrastructure may cause temporary issues of congestion, but the effects would be both minimal and short term, resulting in a less than significant cumulative impact on transportation and traffic across the Installation.

5.0 OTHER CONSIDERATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL POLICY ACT

5.1 Irreversible or Irretrievable Commitment of Natural or Depletable Resources

NEPA requires an analysis of significant, irreversible effects resulting from implementation of a proposed action. Resources that are irreversibly or irretrievably committed to a project are those that are typically used on a long-term or permanent basis; however, those resources used on a short-term basis but cannot be recovered (e.g., non-renewable resources such as metal, wood, fuel, paper, and other natural or cultural resources) are also irretrievable. Human labor is also considered an irretrievable resource. All such resources are irretrievable in that they are used for one project and thus become unavailable for other purposes. An impact that falls under the category of the irreversible or irretrievable commitment of resources is the destruction of natural resources that could limit the range of potential uses of that resource.

Implementation of the Proposed Actions would result in an irreversible commitment of fuel for construction vehicles and equipment and decommissioning and dismantling of facilities, human labor, and other resources. These commitments of resources are neither unusual nor unexpected, given the nature of the Proposed Actions. The Proposed Actions would not result in the destruction of environmental resources such that the range of potential uses of the environment would be limited, and they would not affect the biodiversity of the region.

5.2 Relationship between Local Short-term Use of the Human Environment and Maintenance and Enhancement of Long-term Natural Resource Productivity

NEPA requires consideration of the relationship between short-term use of the environment and the impacts that such use could have on the maintenance and enhancement of long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. Such impacts include the possibility that choosing one option could reduce future flexibility to pursue other options, or that choosing a certain use could eliminate the possibility of other uses at the site.

Implementation of the Proposed Actions would not result in any such environmental impacts because they would not pose long-term risks to health, safety, or the general welfare of the communities surrounding the project area that would significantly narrow the range of future beneficial uses. In

addition, biological productivity would not be affected because implementation of the Proposed Actions would not result in significant cumulative impacts on any biological resources.

5.3 Means to Mitigate and/or Monitor Adverse Environmental Impacts

This section presents a summary of potential mitigation measures, including implementing appropriate BMPs, which could reduce adverse environmental impacts from the alternatives analyzed in this PEA. Potential mitigation measures that would work to reduce potentially significant impacts to a less than significant level would include:

- Potential air quality impacts associated with new stationary sources (power plant and/or CHP plants) would be addressed by incorporating pollution control equipment required by state and federal air quality regulations as well as in the engineering design of the exhaust stack to prevent excessive downwind pollutant concentrations.
- Impacts on cultural resources including the Rolling Pin Barracks Historic District and World War II Temporary Building Historic District would be mitigated through the initiation of consultation per Section 106 of the NHPA to determine what mitigation is necessary for any potential adverse effects to these areas and would follow the Secretary of the Interiors Standards for the Treatment of Historic Properties, except in cases where the demolition of a historic structure is proposed.

Standard requirements and BMPs that could be used include:

- New construction within the historic districts would be designed to conform to the historic character of the district.
- Standard BMPs would be implemented during construction to reduce air quality effects, including controlling dust (e.g., covering trucks, watering exposed soil in dry weather, and promptly seeding/covering exposed areas), limiting idling of equipment, encouraging contractors to use newer model construction equipment, and ensuring proper equipment maintenance.
- All land-disturbing activities that exceed 1 acre would obtain a land disturbance National Pollutant Discharge Elimination System (NPDES) permit as well as other applicable land disturbance permit requirements.
- All construction activities would implement erosion and sediment/pollutant control BMPs to include, but not limited to, inlet protection, dewatering filters, erosion control blankets, and silt fences.

- All developments that exceed 5,000 ft² would implement green infrastructure/low impact development per the Energy Independence and Security Act of 2007 and Executive Order 13693.
- Potential BMPs for conservation of energy and water and for reduction of solid waste to reduce the utility requirements could include the following:
 - Training in water conservation measures for domestic and construction use for staff and contractors
 - Training on eligible materials for recycling municipal solid waste
 - Providing adequate containers for recycling materials
 - The mandatory incorporation of recycling requirements for construction demolition debris into all contracts for outside construction, renovation, and demolition contractors.
- If identified, asbestos and lead-based paint would require implementation of abatement tasks to proceed with redevelopment activities.
- FLW would adhere to applicable policies for the storage of petroleum products on the Installation, including those resulting from project construction.
- FLW would recycle or reuse construction, renovation, and demolition waste to the fullest extent possible and would properly dispose of remaining waste.
- FLW would continue to use pesticides in landscaped areas as needed, but pesticide use would be regulated and pesticides would be stored according to applicable policies and regulations.
- Potential use of vegetative buffers adjacent to fields in proximity to creeks and cover crops species planting/establishment in the non-growing season to protect growing site soils as part of efforts to protect against water quality impacts as a result of biofuel production.
- Developments would incorporate to the extent feasible low impact design features to minimize the impacts to the environment.

5.4 Any Probable Adverse Environmental Effects that Cannot be Avoided and are not Amendable to Mitigation

This EA has determined that the Proposed Actions would not result in any significant immitigable impacts; therefore, any probable adverse environmental effects could be avoided or mitigated.

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6.0 CONCLUSIONS

Based on the analysis performed in this PEA, implementation of the Proposed Actions would have in general less than significant direct, indirect, and cumulative effects on the quality of the natural or human environment. Potential significant but mitigable impacts to air quality could occur as a result of the construction and operation of a power plant, dependent on design aspects of the facility. A detailed impact analysis would be conducted as part of future tiered NEPA reviews as construction details are developed.

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8.0 ACRONYMS AND ABBREVIATIONS

ADP	Area Development Planning
AIT	Advanced Individual Training
APE	Area of Potential Effect
AQI	Air Quality Index
Army	U.S. Department of the Army
BA	biological assessment
BCT	Brigade Combat Team
BMP	best management practice
BN	battalion
BO	biological opinion
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CATCODE	category codes
CEQ	Council on Environmental Quality
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHP	combined heat and power
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COF	Company Operations Facility
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DCO	Defense Connect Online

DFAC	Defense Finance and Accounting Center
DNL	day-night average sound level
DoD	Department of Defense
DOL	Director of Logistics
DPW	Directorate of Public Works
DPW-E	Directorate of Public Works-Environment Division
FLW	United States Army Garrison Fort Leonard Wood
FNSI	Finding of No Significant Impact
FORSCOM	U.S. Army Forces Command
ft ²	square feet/foot
FY	fiscal year
GHG	greenhouse gas
HQ	headquarters
ICRMP	Integrated Cultural Resources Management Plan
IDG	Installation Design Guide
IDP	Installation Development Plan
IMCOM	Installation Management Command
INRMP	Integrated Natural Resources Management Plan
Installation	United States Army Garrison Fort Leonard Wood
ISR	Installation Status Report
ISSP	Initial Integrated Strategic Sustainability Plan
LOE	Line of Effort
LUC	land use control

MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MGD	million gallons per day
MS4	Municipal Separate Storm Sewer System
MSCoE	Maneuver Support Center of Excellence
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NCO	Noncommissioned Officer
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NO ₂	nitrogen dioxide
NOA	Notice of Availability
NO _x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
O ₃	ozone
OSUT	one station unit training
Pb	lead
PCB	polychlorinated biphenyls
PEA	Programmatic Environmental Assessment
PM _{2.5}	fine particulate matter, less than or equal to 2.5 microns in diameter
PM ₁₀	coarse particulate matter, less than or equal to 10 microns in diameter
POLS	petroleum, oils and lubricants
POW	prisoner of war
ppb	parts per billion
ppm	parts per million
psig	pounds per square inch gauge

RCMP	Range Complex Master Plan
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
RPMP	Real Property Master Plan
the Rule	<i>Determining Conformity of Federal Actions to State or Federal Implementation Plans</i>
SO ₂	sulfur dioxide
SO _x	sulfur oxides
TSCA	Toxic Substances Control Act
UEPH	unaccompanied enlisted personnel housing
U.S.	United States
USACE	U.S. Army Corps of Engineers
USACERL	U.S. Army Construction Engineering Research Laboratory
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

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Appendix A: Descriptions of Short-term Projects at
Fort Leonard Wood

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General Instruction Complex 25927

Project 25927 would involve the construction of a general instructional area, administrative space for supervisors/administrative personnel and instructors, barracks, a storage building for boats and unit equipment, covered training area, outdoor physical training areas, drop zone, a hand-to-hand combat training room, rappel tower, training areas and a demolitions training area as well as the relocation of an existing gas chamber training facility. All facilities would include information systems, alarm systems, Intrusion Detection System (IDS) installation, and Energy Monitoring Control Systems (EMCS) connection. Sustainable Design and Development (SDD) and Energy Policy Act of 2005 (EPAct05) features will be incorporated as will DoD Minimum Antiterrorism Standards for Buildings. Supporting facilities include clearing, site development, and grading. Utilities and service connections include water, sanitary sewer, electric and natural gas main extensions and services and information/cable TV systems. Site improvements include parking lot and drive lighting, paving, parking, walks, curbs and gutters, storm drainage and stormwater quality management facilities; landscaping and signage. Heating and air conditioning will be provided by a self-contained system. Accessibility for individuals with disabilities will be provided as will comprehensive building and furnishings related to interior design services.

Instructional Building, Limited Use 58608

Project 58608 would construct a Joint Services Chemical, Biological, Radiological and Nuclear Training Facility capable of supporting new training requirements and equipment. Currently existing facilities provide a less than optimal training environment and are inadequately sized to conduct nuclear, biological and chemical (NBC) Defense Training and as such each service is currently conducting training separately. Since the services utilize common resources and equipment there is a need to build a Joint Services Biological Training Facility to provide an optimum consolidated training environment. This facility will support emerging and future NBC Defense Training requirements and will have the capability to integrate technology upgrades as it evolves. Facility capability requirements will support laboratories, re-configurable shared classrooms, hands on workstations, multipurpose classrooms, procedural rooms, wet and dry rooms (Bio Training), simulator rooms, storage area, administrative areas, open and closed bay areas, outdoor vehicle docking stations, as well as Contractor Logistics Support maintenance bays, motor pool, paved/fenced and a gated parking lot with security lights to store vehicles and all ancillary equipment.

Instructional Building, Limited Use 59546

Construct an investigative center of excellence with 20 classroom XXI's, 80 mock crime scene rooms with 80 interview/interrogation rooms, and administrative space for 40 personnel, break rooms,

restrooms, and shower facilities. In addition, project 59546 would construct advanced laboratory facilities with eye wash safety centers, storage space with 8 individual administrative offices, a mock village, an indoor pistol range, and an unarmed self-defense training area. The project would also provide supporting utilities, administrative parking, and a vehicle drop off and pick up point. The project also provides for comprehensive interior design to the facility.

NCO Academy Complex 61218

Construct a Non-Commissioned Officer Academy Complex totaling 176,025 GSF based on the Standard Facility Planning Criteria for the Non-Commissioned Officer Academy dated March 2012. The Complex will consist of a campus setting and includes general instruction building, auto-aided instruction, limited use instruction, general purpose administration, auditorium, network operations center, learning resource center; covered training area; lawn equipment storage building; running track; and a physical training area on the infield of the multi-purpose athletics field. Supporting elements include new utilities and connections to existing utilities, alarm systems, security lighting, paving, walkways, storm drainage, site clearing and grading, cut and fill, fencing, information systems, landscaping, signage, and a flagpole. Heating and air conditioning to the new facilities will be provided by facility specific self-contained units. The project also accounts for the demolition of existing facilities located at the site. Connections to installation EMCS and IDS will also be provided. SDD and EPAAct05 features will be incorporated as will DoD Minimum Antiterrorism Standards for Buildings. Comprehensive building and furnishings related interior design services are required and will be incorporated into the new facilities. Facilities will be designed to a minimum life of 50 years and energy efficiencies meeting, on average, ASHRE 189.1 standards through improved building envelope and integrated building systems performance.

Centralized Wash Facility 65418

This project is to provide a Central Vehicle Wash Facility with prewash baths and washing stations. The facility equipped with a closed-loop wash water treatment system that continuously recycles water for reuse. The facility would primarily support the heavy equipment and vehicles associated with the TRADOC units located in TA 244. Supporting facilities would include; connection to electrical, water, and sewer collection and distribution systems; stormwater detention areas; and a concrete tactical route adjacent to the facility. Special foundations are required due to soil conditions on the site. SDD and EPAAct05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings as would an EMCS connection. Heating and Air conditioning will be provided by a self-contained unit.

Battalion Complex 65680

Project 65680 involves the construction of a standard design Battalion Headquarters for one Battalion. Primary facilities to be constructed include administrative areas, an operations area with a Sensitive Compartmented Information Facility (SCIF), Operations Center (OC), Network Operations Center (NOC), and classrooms.

Construction includes redundant mechanical and electrical systems with backup power, secure organizational vehicle parking, information systems, alarm systems, IDS installation, and EMCS connection. A generator is required for the sanitary sewer lift station by state law and will be provided. SDD and EPA05 features will be provided and included in the construction of the new facilities. Additional construction includes standard design Company Operations Facilities for 6 companies with the project including an administrative module, supply (readiness) module, covered concrete hardstand area, loading/service areas, information systems, fire protection and alarm systems, IDS installation, and EMCS connection. Supporting elements include site development, utility extensions and connections, sanitary sewer lift station and upgrade, electric substation upgrade, lighting, paving, parking, walks, curbs and gutters, storm drainage, access roads, street improvements, information systems, landscaping and signage. Facility measures in accordance with the DoD Minimum Antiterrorism Standards for Buildings will be provided. Comprehensive building and furnishings related interior design services are required and will be incorporated into the new facilities.

Simulator Building (Motion-Based) 70362

Construction of project 70362 includes simulation bays and applied instructional space, maintenance training bays, training pads, bridge launch/recovery training area, breach vehicle excavation training lands, rail/HETT simulator for loading onto rail and trucks, and training area to support the Joint Assault Bridge and Armored Breaching Vehicle. Primary facilities include petroleum and other hazardous materiel storage, information systems, alarm systems, and an EMCS connection. Primary facilities will require special foundations due to the soil conditions. SDD and EPA05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Supporting facilities include electric service, natural gas, water and sewer services; security lighting; fire protection; paving; walks, curbs and gutters; storm drainage; signage; information systems; site improvements and landscaping. Heating and air conditioning will be provided by a self-contained system. Accessibility for individuals with disabilities will be provided as will comprehensive building and furnishings related to interior design services. The project also includes the demolition of 9 buildings totaling 44,550 SF located on or near the project site.

Fire Station 75660

Construct a standard design two company headquarters fire station with an extra equipment bay. This facility will include apparatus bays; residential areas; administration areas; training areas; information systems; alarm systems; and EMCS connection. SDD and EPA05 features will be provided and included in the construction of the new facilities. Supporting elements include site development, utilities and connections, lighting, paving, parking, walks, curbs and gutters, storm drainage, information systems, landscaping and signage. Measures in accordance with the DoD Minimum Antiterrorism Standards for Buildings will be provided and followed. Comprehensive building and furnishings related interior design services are required and will be incorporated into new facilities.

Storage Building, General Purpose 75738

Construct a general purpose installation storage complex for Garrison activities and hospital storage. The project includes warehouse and administrative facilities, information systems, alarm systems, IDS installation, and EMCS connection. In addition the construction of truck docks and level entry overhead doors would occur as would the construction of administrative offices and customer pickup areas. Heating and air-conditioning will be provided by facility specific self-contained units. Supporting elements include site development, utilities and connections, lighting, paving, parking, walks, curbs and gutters, storm drainage, information systems, landscaping and signage. Measures in accordance with DoD Minimum Antiterrorism Standards for Buildings will be provided and followed. Comprehensive building and furnishings related interior design services are required and will be incorporated into new facilities.

Blood Donor Center 77140

The project is centered on the construction of a blood donor center. Primary facilities include the clinic, technical complexity, technological update, evidence-based design EBD and building information systems. SDD and EPA05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Supporting facilities include electric service, natural gas, water and sewer services; security lighting; fire protection; paving; walks, curbs and gutters; storm drainage; signage; information systems; site improvements and landscaping. Heating and air conditioning will be provided by a self-contained system. Accessibility for individuals with disabilities will be provided as will comprehensive building and furnishings related to interior design services.

Enlisted Unaccompanied Personnel Barracks 78184

Construct Enlisted Unaccompanied Personnel Barracks to replace aging family housing units converted to Unaccompanied Enlisted Personnel Housing at FLW. The housing units use the Army standard 1+1 floor plan configured into a five (5) unit building. Construction includes infrastructure and utility service,

special foundations, alarm systems, building information systems, and connection to the installation EMCS. Measures in accordance with DoD Minimum Antiterrorism Standards for Buildings will be provided and followed as would SDD and EPAAct07 features. Supporting elements include, privately owned vehicle parking areas, site utilities, sanitary sewer lift stations and standby generators required by Missouri Clean Water Law, storm drainage to include storm water retention areas, electrical, water, sewer, gas, curbs and gutters, exterior lighting and signage. Comprehensive building and furnishings related to interior design services are required and will be incorporated into new facilities. Heating and air conditioning will be provided by self-contained systems. The project also includes the demolition of 7 buildings totaling 41,021 SF located on the project site. The buildings no longer meet their intended purpose.

Enlisted Unaccompanied Personnel Barracks 78185

Construct Enlisted Unaccompanied Personnel Barracks to replace aging family housing units converted to Unaccompanied Enlisted Personnel Housing at FLW. The housing units use the Army standard 1+1 floor plan configured into a five (5) unit building. Construction includes infrastructure and utility service, special foundations, alarm systems, building information systems, and connection to the installation EMCS. Measures in accordance with DoD Minimum Antiterrorism Standards for Buildings will be provided and followed as would SDD and EPAAct07 features. Supporting elements include, privately owned vehicle parking areas, site utilities, sanitary sewer lift stations and standby generators required by Missouri Clean Water Law, storm drainage to include storm water retention areas, electrical, water, sewer, gas, curbs and gutters, exterior lighting and signage. Comprehensive building and furnishings related to interior design services are required and will be incorporated into new facilities. Heating and air conditioning will be provided by self-contained systems. The project also includes the demolition of 10 buildings totaling 63,480 SF located on the project site. The buildings no longer meet their intended purpose.

Deployment Railhead Complex 78609

Primary facilities include a unit movement operations facility with centralized vehicle inspection and administrative facilities for pre-joint inspection of vehicles and soldiers prior to deployment; as well as a fuel/defueling station; two-bay in-ground scale and scale house; and fenced organizational vehicle marshalling yard; railroad loading ramps; realigned rail loading area; and interchange yard. All facilities include information systems, alarm systems, IDS installation, and EMCS connection. SDD and EPAAct05 features will be provided and followed as would measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Comprehensive Interior Design and furnishings related design services are required for all primary facilities and will be incorporated. Supporting elements include

clearing, site development, and grading. Utilities and service connections include water, sanitary sewer, electric and natural gas main extensions and services; and information systems. Site improvements include fencing, street relocation, parking lot, drive and organizational marshalling yard lighting, paving, parking, striping, walks, curbs and gutters, storm drainage and storm water quality management facilities; landscaping and signage. Heating and air conditioning will be provided by facility specific self-contained systems.

Airfield Deployment Complex 78610

Primary facilities to be constructed consist of ready building, airfield taxiways, aprons, and vehicle marshalling area to facilitate FORSCOM unit deployment. All facilities would include information systems, alarm systems, IDS installation, and EMCS connection and would incorporate SDD and EPA05 features. Measures in accordance with DoD Minimum Antiterrorism Standards for Buildings will be provided and followed. Comprehensive Interior Design and furnishings related design services are required for all primary facilities and will be incorporated. Supporting elements include clearing, site development, and grading. Utilities and service connections include sanitary sewer lift station and standby generator; water, sanitary sewer, electric and natural gas main extensions and services and information systems. Site improvements include fencing, parking lot, drive and organizational marshalling yard lighting, parking lot and drive lighting, paving, walks, curbs and gutters, storm drainage and storm water quality management facilities; landscaping and signage. Heating and air conditioning will be provided by facility species self-contained systems. The project also includes the demolition and grinding of existing pavement for reuse on the installation.

Automation-Aided Instructional Building Construction 78645

The project is centered on the construction of a two-story automation-aided instruction building at TA 244, horizontal skills training area to address a shortfall of mission-critical training space and to replace inadequate facilities currently dispersed throughout the area. The project includes multi-purpose classrooms, classroom XXIs (with raised flooring for cable runs), digital training access center, resource center, administrative and instructor offices, auditorium, test control rooms, applied instruction modules, network operation center, computer maintenance area, storage areas, information systems, alarm systems, IDS installation, and an EMCS connection. Two 10-ton overhead cranes are included in the vehicle maintenance bays, along with an oil/water separator large enough to support the entire facility. SDD and EPA05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Supporting facilities include site development, domestic water service; sanitary sewer service; fire protection water services; electric service; gas service; fiber optic data/communication service and line extension; fire hydrants, paving, walks, curbs and gutters; access

roads and employee/student/visitor parking areas; storm drainage; security fencing and gates; security barrier bollards; information systems; site lighting; drainage conveyance; emergency power generator; landscaping; and signage. Heating and air conditioning will be provided by a self-contained system. Accessibility for individuals with disabilities will be provided as will comprehensive building and furnishings related to interior design services.

Automation-Aided Instructional Building Renovation and Addition 78646

The project is centered on the renovation of Building 5400 (Brown Hall) and the construction of two additions to the building, one on the north end and one on the south end. The renovation portion of the project includes demolition/replacement of walls, conversion of some administrative areas to classrooms, an upgrade to the HVAC system, replacement of boilers, and addition of a sprinkler system throughout. The additions include multi-purpose classrooms, classroom XXIs (with raised flooring for cable runs), laboratory instructional space, administrative and instructor offices, auditorium, test control rooms, applied instruction modules, storage areas, information systems, alarm systems, IDS installation, and EMCS connection. Freight elevators will be required in each addition as well as direct connections to the existing facility on the first floor level only. SDD and EPA05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Supporting facilities include site development, domestic water service; sanitary sewer service; fire protection water services; electric service; gas service; fiber optic data/communication service and line extension; copper data/ communication service and line extension; fire hydrants, paving, walks, curbs and gutters; access roads and employee/student/visitor parking areas; storm drainage; security fencing and gates; security barrier bollards; information systems; site lighting; drainage conveyance; emergency power generator; landscaping; signage, an intrusion detection system, site improvements, and outdoor instructional spaces. Demolition/replacement of Building 5401 is also included. Heating and air conditioning will be provided by self-contained systems. Accessibility for individuals with disabilities will be provided as will comprehensive building and furnishings related to interior design services.

Electric Power Gas-Fired 78848

Project 78848 is slated to modify an existing central energy plant. The modification will work to capture waste heat from a power generation process to decrement energy expended in the supply of heating, cooling, and domestic hot water on a central distribution system. The project includes the capability of expanding this central energy plant for the use of alternative fuels such as biomass or other renewable fuels sources as technologies and economics improve. Additional modifications would include automated controls, metering, information systems, alarm systems, emission controls, IDS and EMCS. SDD and EPA05 features will be provided. Measures in accordance with DoD Minimum Antiterrorism Standards

for Buildings will be provided and followed. Comprehensive Interior Design and furnishings-related design services are required for all primary facilities and will be incorporated. Preparation of required permits and air quality monitoring will be required. Supporting elements include clearing, site development, and grading. Utilities and service connections include sanitary sewer lift station and standby generator; water, sanitary sewer, electric and natural gas main extensions and services and information systems. Primary electric line & steam/high-temperature water line extensions from the existing lines to the power plant will be constructed. Site improvements include parking lot and drive lighting, access road, paving, parking, walks, curbs and gutters, storm drainage and storm water quality management facilities; landscaping and signage. Heating and air conditioning will be provided by facility specific self-contained systems.

Administrative Building, General Purpose 80435

Construct a general purpose administrative building. Primary facility includes all required administrative, conference, meeting, charrette studio, copier, communications, short- and long-term storage spaces, and a recycle room. A fireproof vault will be provided for storage of record facility drawings. All facilities include information systems, alarm systems, installation, and EMCS connection. SDD and EPA05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings. Comprehensive Interior Design and furnishings related design services are required for all primary facilities and will be incorporated. Supporting elements include clearing, site development, and grading. Utilities and service connections include sanitary sewer lift station and standby generator; water, sanitary sewer, electric and natural gas main extensions and services and information systems. Site improvements include parking lot and drive lighting, paving, parking, walks, curbs and gutters, storm drainage and storm water quality management facilities; landscaping and signage. Heating and air conditioning will be provided by facility specific self-contained systems.

Rescue Training Facility 85201

Primary facilities (Domestic Response Training Complex) to be constructed include a range classroom building, maintenance facility, storage shed, covered training areas, field latrines, range operations and storage buildings, vehicle storage buildings, railroad car training area, control observation towers, training building complex, tunnel complex, collapsed structure training area, two cave complexes, rubble pile training area and task training sites. This training complex will train soldiers on rope rescue, structural collapse, confined space, vehicle rescue, water awareness, trench and excavation rescue, and machinery rescue. Other specialty training areas will include, a rubble pile, lifting and rigging site, shoring site, metal cutting site, breaching and breaking site, construction of concrete pads site, and a site for drilling and anchoring. All indoor facilities will include information systems, alarm systems, IDS installation, and

an EMCS connection. SDD and EPO5 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings

Company Operations Facility 86713

Construct standard design Company Operations Facilities Readiness Bays (no administrative module) for 2 companies. Project includes an administrative module, a supply (readiness) module, a covered concrete hardstand area, loading/service areas, information systems, alarm systems, IDS installation, and an EMCS connection. Sustainability and energy enhancement measures would be included. Supporting components would include site development, utilities and connections, lighting, paving, parking, walks, curbs and gutters, storm drainage, information systems, landscaping and signage. Heating and air conditioning will be provided by either a self-contained system or a connection to the existing energy plant. Facilities will be designed to a minimum life of 30 years in accordance with DoD's Unified Facilities Code (UFC 1-200-02) including energy efficiencies, building envelope and integrated building systems performance and measures in accordance with DoD Minimum Antiterrorism Standards for Buildings would be included.

Fire Station 86714

Construct a standard design one company satellite fire station. This facility will include apparatus bays, residential areas, administration areas, training areas, information systems, alarm systems, and an EMCS connection. Sustainability and energy enhancement measures would be included as part of construction. Supporting facilities include site development, utilities and connections, lighting, paving, parking, walks, curbs and gutters, storm drainage, information systems, landscaping and signage. Heating and air conditioning will be provided by either a self-contained system or a connection to the existing energy plant. Facilities will be designed to a minimum life of 30 years in accordance with DoD's Unified Facilities Code (UFC 1-200-02) including energy efficiencies, building envelope and integrated building systems performance and measures in accordance with DoD Minimum Antiterrorism Standards for Buildings would be included.

Training Support Center 88041

Construct a training support facility, with primary facilities to include classrooms, open training spaces, administrative areas, rest rooms, arms vault storage, entry and reception area, and climate controlled material storage areas. Construction would include an IDS installation, EMCS connections, and building information systems. Special foundations are required to support historical vehicle loads. Supporting facilities include electrical, gas, water and sewer, exterior lighting, storm drainage, fire protection, walks, curbs and gutters, parking, site improvements and information systems. Heating and air conditioning will be provided by self-contained systems, meeting humidity control requirements for historical training

artifacts. Facilities will be designed to a minimum life of 30 years in accordance with DoD's Unified Facilities Code (UFC 1-200-02) including energy efficiencies, building envelope and integrated building systems performance. SDD and EPAAct05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings

Central Issue Facility 88319

The construction of a standard design Large Training Installation Central Issue Facility to include a warehouse and issue spaces, troop assembly/orientation/queuing spaces, administration spaces and toilet/shower spaces. Warehouse floor shall be designed to support multiple tiered pallet racks, and support operation of 10,000 pound capacity forklifts. Supporting infrastructure shall include energy monitoring and control systems and underground utilities (water, sewer, gas), electric service, loading docks, ramps, parking and access roads, paving, sidewalks, curbs and gutters, sanitary sewer system, storm drainage, information systems, landscaping, and site improvements. The project also includes the relocation of existing rail loading ramps in the footprint of construction and realign railroad to new ramps. Other project components include the construction of a water line extension from new water tower past the Central Issue Facility to a connection point near hospital. Accessibility for individuals with disability will be provided at the troop assembly/orientation/queuing spaces, administration spaces and toilet/shower spaces. Anti-terrorism/Force Protection measure includes Standoff distance, laminated glass and security lighting will be included. A self-contained system (gas fired) will be provided for heating. SDD and EPAAct05 features will be provided and followed as will measures in accordance with DoD Minimum Antiterrorism Standards for Buildings