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Environmental Protection Division

Prepared for: Internal Use

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Threatened and Endangered Species Habitat Management Plan

Area of Environmental Interest Site Plan for the Jemez Mountains Salamander

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Los Alamos National Laboratory
Environmental Stewardship Group (ENV-ES)

July 2013

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1.0 SPECIES DESCRIPTION – JEMEZ MOUNTAINS SALAMANDER

1.1 Status

The Jemez Mountains Salamander (*Plethodon neomexicanus*; JMS) was listed in New Mexico as Endangered under the Wildlife Conservation Act of New Mexico in 2006 (NMDGF 2006). In September 2012 the U.S. Fish and Wildlife Service proposed the JMS as Endangered under the Endangered Species Act (77 FR 56482; Federal Register 2012). The final listing of the JMS as Endangered under the Endangered Species Act (ESA) is anticipated in late summer or early fall of 2013.

1.2 General Biology

The JMS is endemic to the Jemez Mountains of north-central New Mexico and is found in Los Alamos, Rio Arriba, and Sandoval counties (Stebbins and Riemer 1950). It is one of two endemic plethodontid salamanders that occur in New Mexico. The JMS occurs predominantly at elevations between 6,988 to 11,254 feet (2,130 to 3,430 meters) in mixed-conifer forest with greater than 50% canopy cover consisting mainly of Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco), blue spruce (*Picea pungens* Engelm.), Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), white fir (*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.), limber pine (*Pinus flexilis* James), ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson) and quaking aspen (*Populus tremuloides* Michx.). The ground surface in forest areas has (a) Moderate to high volumes of large fallen trees and other woody debris, especially coniferous logs at least 10 inches (25 centimeters) in diameter, particularly Douglas fir, which are in contact with the soil in varying stages of decay from freshly fallen to nearly fully decomposed; or (b) Structural features, such as rocks, bark, and moss mats that provide the species with food and cover. Underground habitat in forest or meadow areas contains interstitial spaces provided by: (a) Igneous rock with fractures or loose rocky soils; (b) Rotted tree root channels; or (c) Burrows of rodents or large invertebrates (Degenhardt et al. 1996; Federal Register 2013).

Plethodontid salamanders, which lack both lungs and gills, breath through the mucous membranes in their mouth and throat and through their moist skin. The JMS is completely terrestrial and does not use standing surface water for any life stage (Federal Register 2012). Present in its habitat year-round, the JMS spends most of its life underground, but can be found on the surface when conditions are warm and wet, approximately July through September. During this time, the JMS can be found under rocks, bark, and moss mats and inside and under logs (Ramotnik 1986, Everett 2003). The JMS eats invertebrates, including ants, mites, and beetles, and is thought to lay its eggs underground (Federal Register 2013).

1.3 Threats

The principal threats to the habitat of the JMS include historical fire exclusion and suppression and severe wildland fires; forest composition and structure conversions; post-fire rehabilitation; forest and fire management; roads, trails, and habitat fragmentation; recreation; and disease (Federal Register 2012).

2.0 HABITAT IMPACTS

2.1 Introduction

The primary threats to the JMS on Los Alamos National Laboratory (LANL) property are impacts to habitat quality or destruction of individual salamanders caused by LANL or Los Alamos County operations. Forested LANL property is also subject to impacts from severe wildland fire and wildfire suppression.

2.2 Impacts on Habitat Quality

2.2.1 Development

Property at LANL varies from remote isolated land to heavily developed and/or industrialized. Most of the large developed areas at LANL are found on mesa tops, generally in the northern and western portion of LANL. The areas of JMS habitat currently most impacted by development occur in Los Alamos Canyon. There is a secondary paved road (West Road) in the bottom of the canyon that exits the canyon on the north-facing slope through JMS habitat. The canyon bottom also contains a recreational ice rink operated by Los Alamos County on an inholding owned by Los Alamos County. Development that reduces the occurrence of primary constituent elements of JMS in core habitat would likely have a negative impact on the species.

2.2.2 Pedestrians and Vehicles

Many canyon bottoms and mesa tops at LANL have dirt roads traversing them. Most of these roads are gated; however, many of these roads are accessible to LANL employees and the public on foot or by bike. Some areas, such as Los Alamos Canyon, are frequently used by hikers and dog owners on active and historic trails which traverse the canyon, through JMS habitat in places. Maintenance of roads and trails in JMS habitat may have a negative impact on the species.

2.2.3 Severe Wildland Fire and Wildfire Suppression

Stand-replacing wildfires significantly change forest composition and structure, and reduce canopy cover. Even ground wildfires may reduce the volume of fallen logs and large woody debris. Large areas of historic JMS habitat have been impacted by stand-replacing wildfires associated with current forest stocking conditions, drought, and high temperatures (Federal Register 2012). Forested habitats on LANL are also subject to severe wildland fires. To mitigate wildfire risks, some areas of LANL have been treated for fuels reduction and creation of fuel breaks both pre-emptively and during active wildfire suppression. Both wildfires and wildfire suppression activities can negatively impact the primary constituent elements of JMS core habitat.

2.3 Impacts on Individual Salamanders

2.3.1 Disease

The amphibian pathogenic fungus *Batrachochytrium dendrobatidis* (Bd) was found in a wild-caught JMS in 2003 (Cummer et al. 2005) on the east side of the species' range and again in another JMS in 2010 on the west side of the species' range (Federal Register 2012).

Batrachochytrium dendrobatidis causes the disease chytridiomycosis, whereby the Bd fungus attacks keratin in amphibians. In adult amphibians, keratin primarily occurs in the skin. The symptoms of chytridiomycosis can include sloughing of skin, lethargy, morbidity, and death. Chytridiomycosis has been linked with worldwide amphibian declines, die-offs, and extinctions, possibly in association with climate change (Pounds et al. 2006). Chytridiomycosis may be a threat to the JMS because due to the fact that this disease is a threat to many other species of amphibians and the pathogen has been detected in the JMS (Federal Register 2012).

As part of a cooperative study with the New Mexico Department of Game and Fish between 2007 and 2012, various amphibian species including the canyon tree frog (*Hyla arenicolor*), western chorus frog (*Pseudacris triseriata*), Woodhouse's toad (*Anaxyrus woodhousii*), tiger salamander (*Ambystoma tigrinum*), and JMS were tested for Bd infection at LANL. To date, all sampling has been negative for Bd infection (Fresquez et al. 2013).

2.3.2 Destruction of Individual Salamanders

During periods of the year when JMS are on the soil surface, when conditions are warm and wet (generally July – October), they are vulnerable to injury and mortality from soil-disturbing activities, including operation of heavy equipment in core habitat. They also are at risk to be found and collected by people.

3.0 AEI GENERAL DESCRIPTION FOR THE JEMEZ MOUNTAINS SALAMANDER

3.1 Description of a Jemez Mountains Salamander AEI

An area of environmental interest (AEI) consists of two areas, a core area and a buffer area. The core habitat is defined as suitable habitat where the JMS occurs or may occur at LANL. The core habitat consists of sections of north-facing slope that contain the required micro-habitat to support JMS. The buffer area is 328 feet (100 meters) wide extending outward from the edge of the core area.

3.2 Method for Identifying a Jemez Mountains Salamander AEI

The first step in identifying potential JMS at LANL was to use a geographic information system (GIS) to model habitat. Early modeling efforts by Hathcock (2008) identified areas of potential habitat and that model was further refined. The following parameters were modeled in the GIS:

- Elevation: 7000 feet (2150 meters) and above
- Slope: Greater than 20 degrees
- Aspect: north-facing +/- 20 degrees
- Land cover: Mixed conifer
- Land use: Undeveloped
- Modeled habitat is only selected if it is greater than five contiguous 30m x 30m pixels in size

Once this habitat layer was developed (Figure 1), a second layer was modeled that examined the level of shade in the habitat, also known as an illumination index (Figure 2). Since the JMS

needs cool moist conditions, an illumination index model would further highlight areas where this habitat type may occur or further reinforce the areas selected by the GIS modeling. The illumination index describes the amount and extent of solar radiation reaching the Earth's surface at a given point. This takes into account the topography that may cast shadows. The illumination model was developed using the 16 foot (4.8 meter) resolution digital elevation model hillshade and using the Surface toolbox in ArcToolbox (Environmental Science Research Institute, Redlands, CA, USA) using the highest height of the sun on June 21st at 1:00pm, altitude of 74.4 and Azimuth of 178.4, when the sun would be at its maximum height. These procedures were based on work done by Reilly et al. (2009).

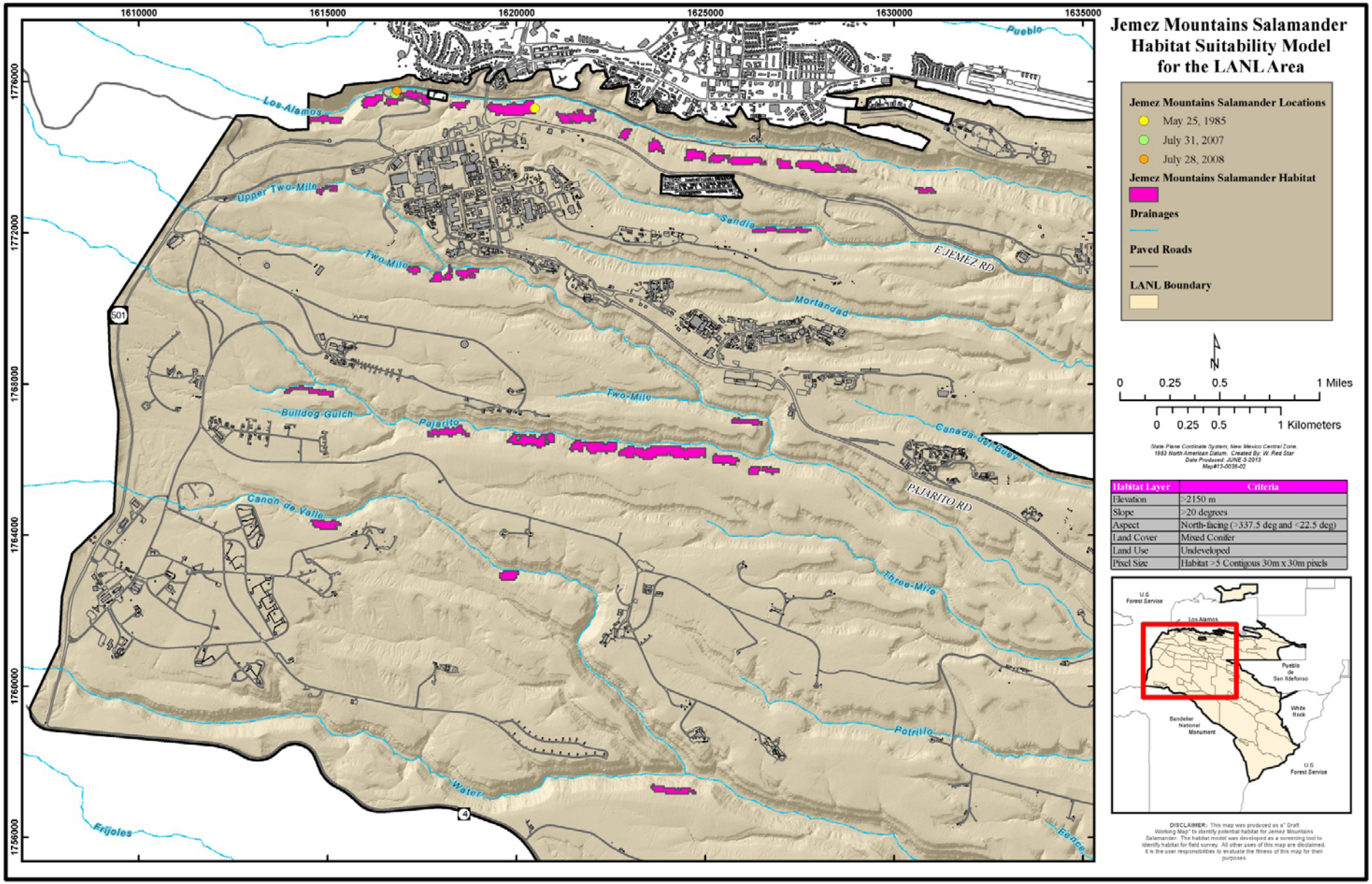

Figure 1. Initial Jemez Mountains Salamander Habitat Modeling Results

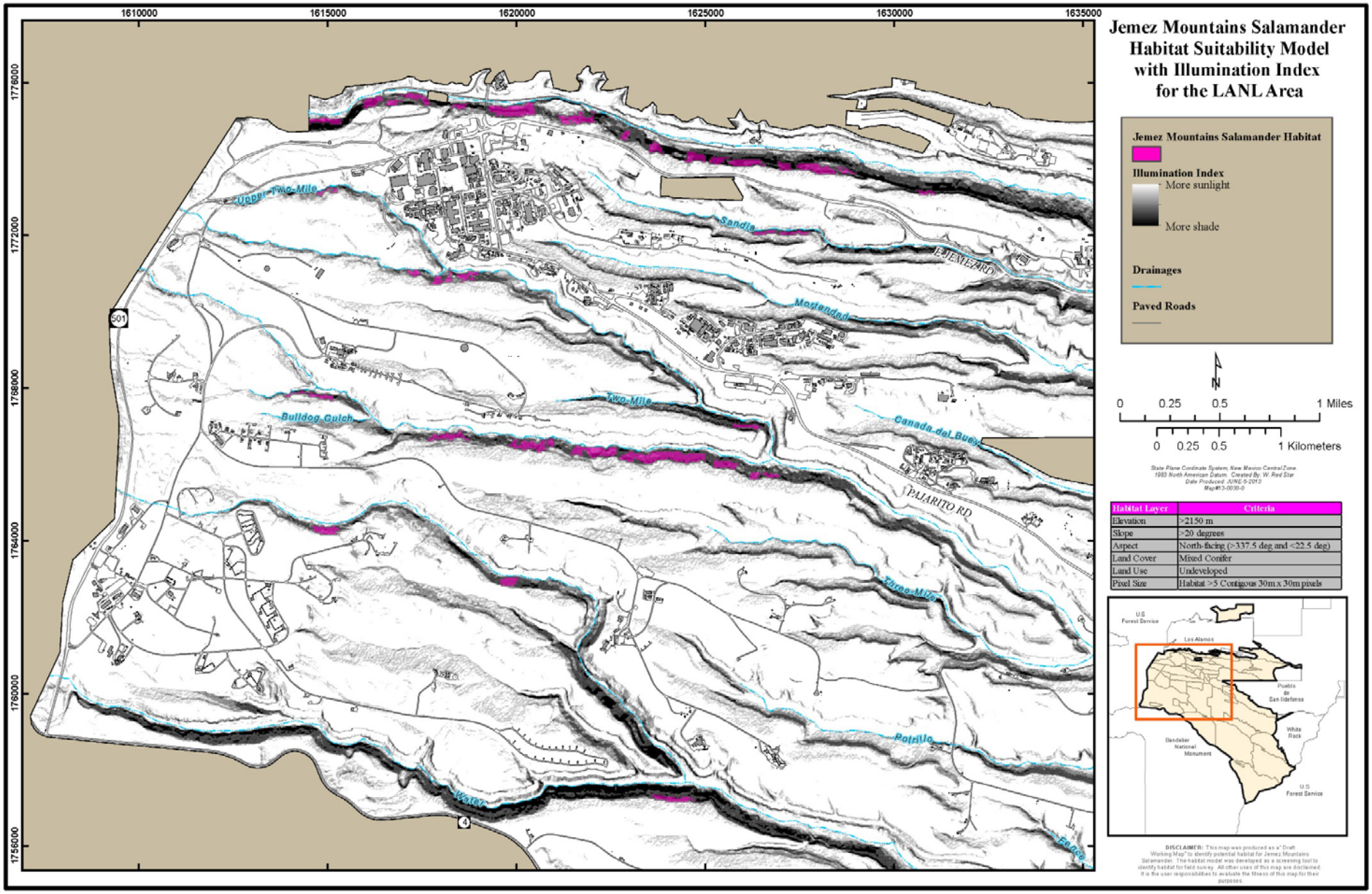

Figure 2. Illumination Index of Modeled Habitat

Once this modeling was complete, LANL staff biologists performed field validation to verify the suitability of the modeled habitat. The goal was to verify that mixed conifer was still the dominant cover class in the selected area. The GIS analysis used data from a landcover map created by McKown et al. (2003). There have been changes in habitat since this landcover map was published from fire and extreme drought effects. Since LANL is on the extreme edge of the JMS's lower elevational range, a key component in this part of its range is soil moisture content. During field validation, evidence of a moist mixed conifer habitat versus a dry mixed conifer habitat was noted. One of the key indicators used to delimit areas of moist versus dry mixed conifer during the field validation was the presence of white fir (Evans et al. 2011) combined with a high canopy cover.

Field validation of the model occurred in May 2013, or decisions were based on earlier field visits to the sites from other projects. Each field validation consisted of staff biologists walking down all of the modeled habitat polygons to look for the presence of indictor features. If a polygon of modeled habitat contained white fir, indicating a moist wet conifer type habitat, a high canopy closure, and other signs of high habitat quality such as dead logs, moss or other areas that could be used as cover by the JMS, then the polygon was marked for retention in the final core habitat. Polygons that did not contain the necessary habitat requirements were omitted. Not shown in figure 1 was one polygon of potential habitat which was located in Rendija Canyon in a tract of land that is scheduled to be transferred to Los Alamos County in the future. This habitat was evaluated in 2012 and determined to not have any of the required habitat variables needed for the JMS.

After the field validation was complete, the final core habitat boundaries that LANL will recognize were hand digitized using ArcGIS (Environmental Science Research Institute, Redlands, CA, USA) by staff biologists in and around the validated modeled polygon and areas between polygons if appropriate. The core habitat occurs on the north-facing slopes of canyons. Toward the rim of the canyon the core boundaries end where the mixed conifer ends. In the canyon bottoms the core boundary extends to the edge of the stream channel. The upstream and downstream core boundaries end where the mixed conifer ends (Figure 3). A buffer habitat was extended around the core to a distance of 328 feet (100 meters) outward. Not shown in figure 3 is the Fenton Hill satellite facility in the Jemez Mountains off of NM Highway 126. This facility is on land leased to LANL by the Santa Fe National Forest. The entire footprint is considered to be developed core habitat for the JMS, since proposed critical habitat is adjacent to the facility.

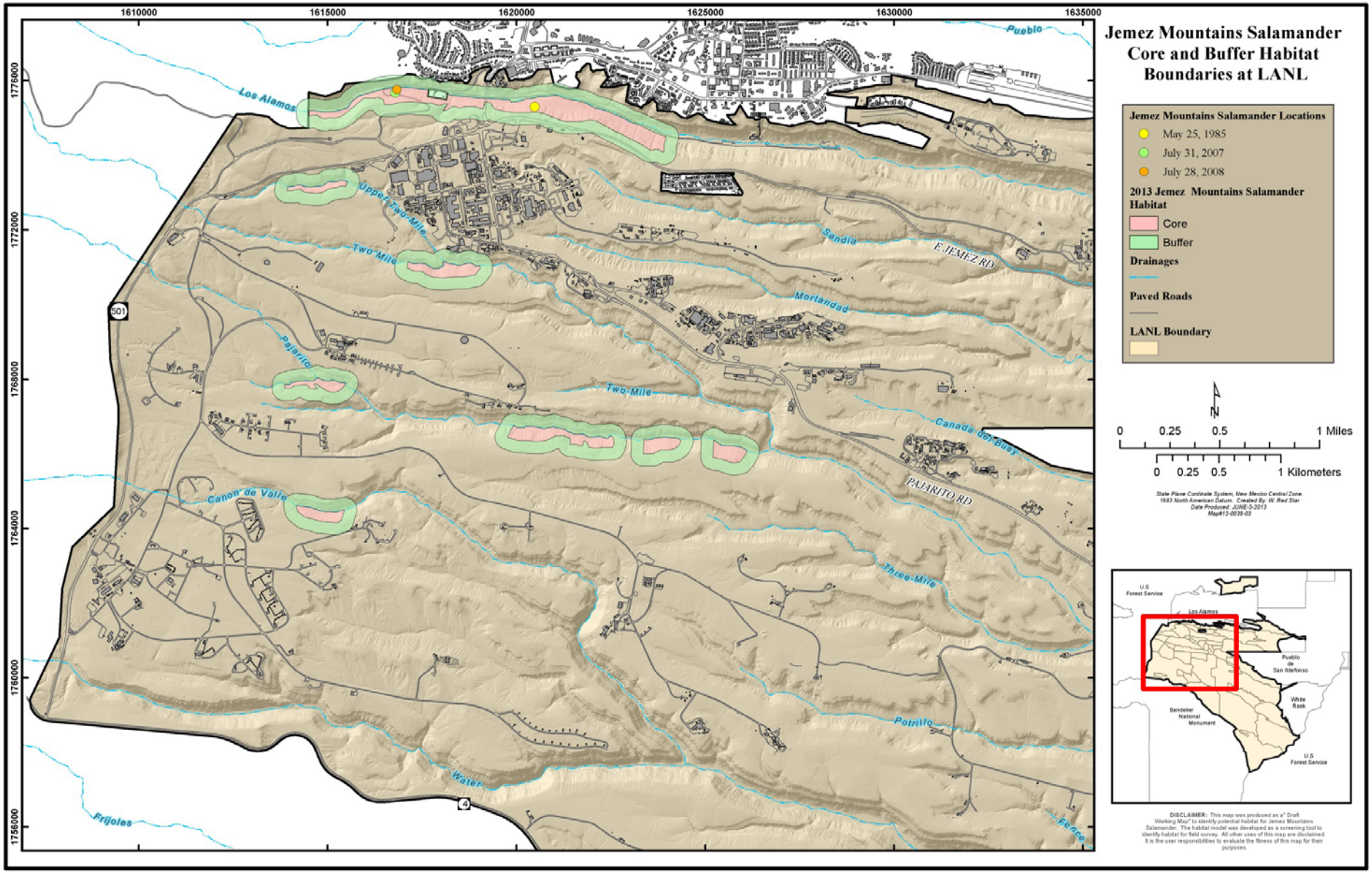

Figure 3. Final Core and Buffer Habitat Boundaries for the Jemez Mountains Salamander

3.3 Location and Number of Jemez Mountains Salamander AEIs

The identified JMS core habitats were grouped by canyon system into AEIs, which contain contiguous and noncontiguous habitat areas. The largest contiguous section of JMS habitat at LANL is in Los Alamos Canyon. There are two noncontiguous areas of habitat in Two-mile Canyon, four in Pajarito Canyon, one contiguous area in Cañon de Valle, and the entire Fenton Hill facility.

4.0 AEI MANAGEMENT

4.1 Overview

This AEI management section provides guidelines for LANL operations to reduce or eliminate the threats to the JMS from habitat alterations that reduce habitat quality. Habitat alterations are considered for all AEIs and for both core and buffer areas. Developed areas that have ongoing baseline levels of activities and are not suitable habitat for JMS have different restrictions than undeveloped core or buffer areas. AEIs for different species may overlap, and an activity must meet the guidelines of all applicable site plans to be allowable. Protective measures are described as management practices that should be followed when working in AEIs.

4.2 Definition and Role of Occupancy in AEI Management

Occupancy simply refers to whether or not an AEI is occupied by the JMS. The Los Alamos Canyon AEI is known to be occupied based on past surveys. Surveys for the JMS are known to have a very low detection rate for occupied areas, so at LANL all AEIs are assumed to be occupied at all times. If needed, site-specific surveys will be conducted by federally permitted staff biologists.

4.3 Definition and Role of Developed Areas in AEI Management

Developed areas include all building structures, paved roads, improved gravel roads, and paved and unpaved parking lots. The majority of JMS core habitat is in undeveloped areas except for the satellite facility at Fenton Hill and a small amount of habitat in Los Alamos Canyon where West Road crosses the habitat. Generally, developed areas will not have restrictions; however some of the undeveloped sections within the footprint of Fenton Hill may contain the JMS when they move on the surface during the rainy season between July – October. Any project that occurs within developed core habitat will be evaluated by biological resources subject matter experts for ESA compliance.

4.4 General Description of Core and Buffer Areas and Allowable Area Development

The purpose of buffer areas is to protect core areas from habitat degradation. The current levels of development in buffer and core areas represent baseline conditions for this site plan. No further development is allowed in the core area under the guidelines of this site plan. Any development in a buffer area will be reviewed by biological resources subject matter experts to ensure that there are no impacts to the core habitat.

4.5 Emergency Actions

If safety and/or property are immediately threatened by something occurring within an AEI (for example, wildfire, water line breakage, etc.) please contact a biological resources subject matter expert (1-505-665-3366) as soon as possible. If the emergency occurs outside of regular business hours, contact the Emergency Management Office (1-505-667-6211). This office will then communicate with the appropriate LANL personnel.

4.6 Introduction to AEI Management Guidelines

Section 4.7 provides the guidelines for habitat alterations and allowable activities in AEI core and buffer areas for the JMS. It describes what and where habitat alterations are allowed under the guidelines of this site plan. If an activity does not meet the restrictions given in the guidelines, the activity must be individually reviewed for ESA compliance through the section 7 consultation process. This site plan only provides guidelines for the JMS AEIs. If an activity is desired in an area with overlapping AEIs, all applicable site plans must be consulted. AEI maps show the location of all AEIs in an area. Biological resources subject matter experts (1-505-665-3366) are always available to help interpret site plans and answer questions.

4.7 Definition of and Restrictions on Habitat Alterations

4.7.1 Definition of Habitat Alterations

Habitat alteration includes any action that alters the soil structure, vegetative components necessary to the species, water quality, or hydrology in undeveloped areas of an AEI. An actual activity may take place outside of the AEI and will be considered habitat alteration if consequences of the activity have effects inside the AEI core. Habitat alterations would also include soil pits for soil samples deeper than 6 inches (15.2 centimeters) using either hand or mechanized augers. Any activity that might disturb the soil during the rainy season between July – October (or when freezing temperatures begin, whichever comes first) when the JMS is found on the surface will need to be reviewed by biological resources subject matter experts.

The habitat components most important to the JMS include soil structure and vegetative structure. The forest structure within an area designated as a JMS AEI is important because it provides the moist cool microclimate necessary for the JMS.

4.7.2 Fuels Management Practices to Reduce Wildfire Risk

One of the primary threats to the JMS is wildfire (Federal Register 2012), but they also require habitat with a high canopy cover which makes fuels reduction challenging. Within undeveloped core areas, thinning trees to a level of 80% canopy cover or higher is approved. Trees may not be thinned below 80% canopy cover without further ESA review by biological resources subject matter experts. Large logs on the ground should be left in place and not chipped. Understory thinning that does not reduce total canopy cover below 80% is permitted. Large trees that are felled should be left as large logs on the ground. Smaller trees and understory shrubs that may be thinned should be dispersed and left on-site to aid in soil moisture retention. Thinning activities should not occur during the rainy season between July – October (or when freezing temperatures begin, whichever comes first) when the JMS is found on the surface.

In buffer areas, thinning of trees can occur to the current LANL-approved prescription level; however, clear-cutting is not permitted.

Biological resources subject matter experts are available to provide guidance and mark trees for thinning (1-505-665-3366).

4.7.3 Utility Corridors

Habitat alterations such as cutting down trees that threaten power lines are allowed within 26 feet (8 meters) of either side of an existing electrical utility line at LANL under existing guidelines and engineering controls (Sam Martinez, personal communication, June 20, 2013). This level is approved in all areas of an AEI. New utility lines and utility lines requiring clearance of a right-of-way greater than 52 feet (16 meters) total in core habitat must be individually reviewed for ESA compliance through the section 7 consultation process.

4.7.4 Restrictions on Habitat Alterations

Habitat alterations other than the fuels management practices and utility corridor maintenance described above are not allowed in undeveloped core areas under the guidelines of this site plan. If a project or activity is planned that would alter habitat in an undeveloped core area, it must be individually evaluated for ESA compliance through the section 7 consultation process. Habitat alterations in buffer areas must be reviewed by biological resources subject matter experts to ensure that there are not any impacts to core habitat.

5.0 JEMEZ MOUNTAINS SALAMANDER AEI DESCRIPTIONS

5.1 Los Alamos Canyon JMS AEI

5.1.1 Environmental Description

5.1.1.1 Location

This AEI is located in Los Alamos Canyon (Figure 4) in Los Alamos County, New Mexico. This AEI is one contiguous unit in Technical Areas (TAs) 3, 43, 61, and 62. The Los Alamos Canyon JMS AEI is 239.2 acres (96.8 hectares) in size, with 73.4 acres (29.7 hectares) in the core and 165.8 acres (67.09 hectares) in the buffer.

5.1.1.2 Overlapping AEIs

This AEI overlaps the Los Alamos Canyon Mexican Spotted Owl AEI.

5.1.1.3 Vegetation

Table 1 describes the vegetation types present in this AEI based on the 1/4 hectare physiognomy cover classes land cover types in the LANL land cover map (McKown et al. 2003).

Table 1. Vegetation Types in the Los Alamos Canyon Jemez Mountains Salamander Area of Environmental Interest Core Habitat

Los Alamos Canyon Land Cover Type	Total Acres in Core Habitat
Mixed conifer-Spruce-Fir Forest	50.59

Ponderosa pine Forest	9.71
Ponderosa pine-Mixed conifer Woodland	8.78
Shrubland	2.54
Aspen Forest	1.39
Pinon-Juniper Woodland	0.34
Pinon-Juniper Forest	0.03
Riparian-Wetland	0.003

5.1.2 Human Impacts

5.1.2.1 Existing Developments

The Los Alamos Canyon JMS AEI has existing development in the buffer area. In the core area only West Road is developed. Developed areas in the buffer include LANL office buildings, light industrial areas, and roads. Development has occurred primarily on the mesa containing the LANL operation centers. Currently there is a paved road in the bottom of Los Alamos Canyon (West Road) which crosses core habitat, which may be improved to bring it up to current code in the future. Power lines cross the Los Alamos Canyon JMS AEI in three locations. A segment of abandoned power line runs along the canyon bottom near the east end of the AEI. The Los Alamos County Ice Rink is owned by the Los Alamos County and borders JMS AEI core habitat on three sides. Future development is possible near this area and would require further review for ESA compliance through the section 7 consultation process. Formally recognized trails that are used regularly for recreation cross this AEI in 3 places. Future upgrades to roads or trails that cross core areas of the AEI will require further review for ESA compliance through the section 7 consultation process. An 8 inch (20.3 centimeter) gas line crosses the canyon through core habitat. This line is owned and maintained by the New Mexico Gas Company. The New Mexico Gas Company periodically performs maintenance on the line. Maintenance on this line will require further review for ESA compliance through the section 7 consultation process. The New Mexico Gas Company is pursuing their own compliance for the maintenance work which will cover the segment of line at LANL that occurs here in Los Alamos Canyon.

5.1.2.2 Access

This AEI is accessible by a LANL road at the bottom of the canyon. Formally recognized trails that are used regularly for recreation cross this AEI in 3 places. Other than trails that traverse the slope, the core area does not have any access.

5.1.3 Recommendations and Protective Measures

Since there are confirmed locations in this AEI, special consideration should be given to impacts to this AEI.

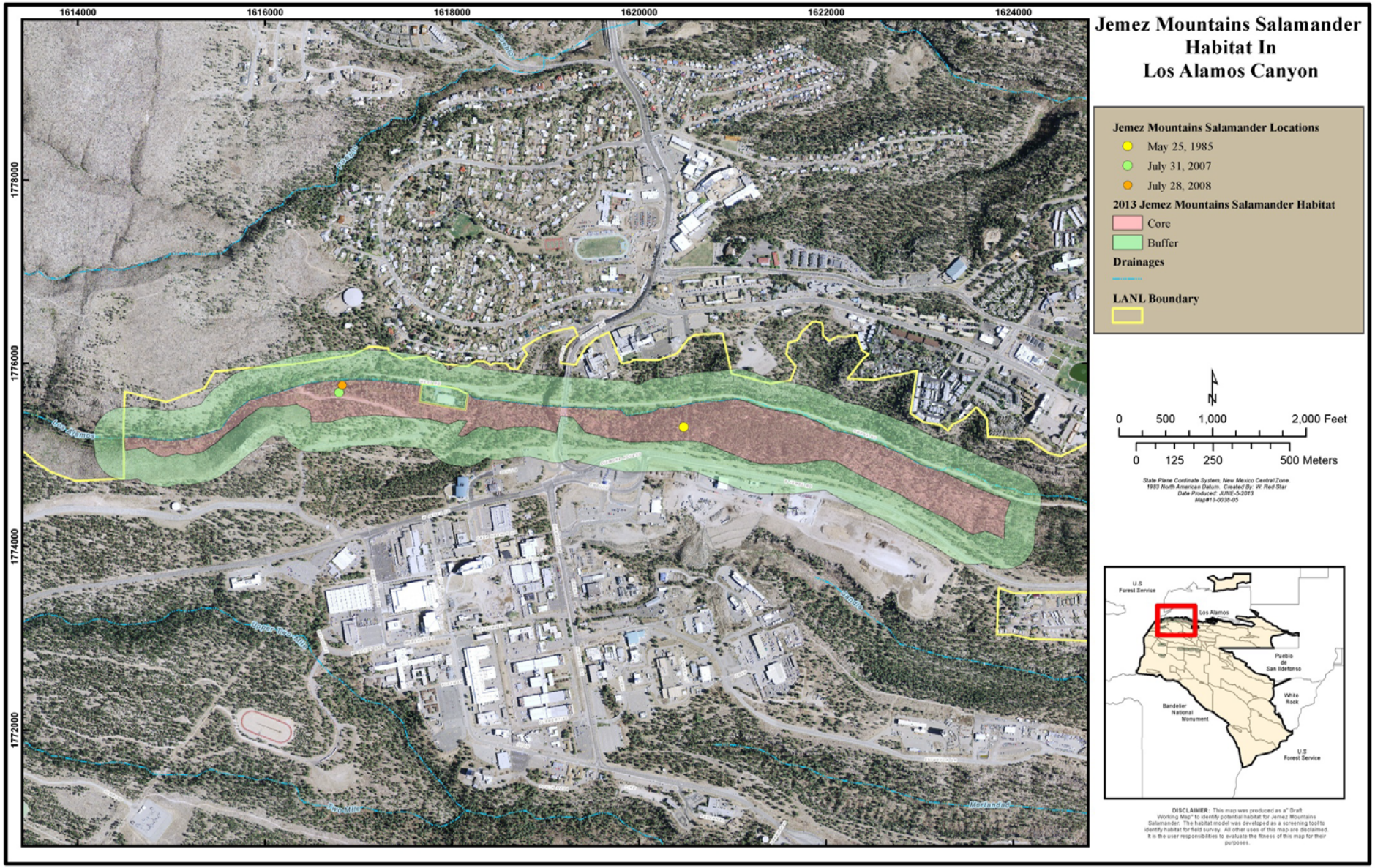

Figure 4. Los Alamos Canyon Jemez Mountains salamander Area of Environmental Interest

5.2 Two-mile Canyon JMS AEI

5.2.1 Environmental Description

5.2.1.1 Location

This AEI has two separate areas. They are located in Two-mile Canyon (Figure 5) in Los Alamos County, New Mexico. These areas are in TAs 3, 6, 58, 59, and 62. The Two-mile Canyon JMS AEI is 93.1 acres (37.67 hectares) in size, with 18 acres (7.28 hectares) in the core and 75.1 acres (30.39 hectares) in the buffer.

5.2.1.2 Overlapping AEIs

This AEI does not overlap any other AEIs.

5.2.1.3 Vegetation

Table 2 describes the vegetation types present in this AEI based on the 1/4 hectare physiognomy cover classes land cover types in the LANL land cover map (McKown et al. 2003).

Table 2. Vegetation Types in the Two-mile Canyon Jemez Mountains Salamander Areas of Environmental Interest Core Habitat

Two-mile Canyon Land Cover Type	Total Acres in Core Habitat
Mixed conifer-Spruce-Fir Forest	14.72
Ponderosa pine Forest	2.99
Ponderosa pine-Mixed conifer Woodland	0.32

5.2.2 Human Impacts

5.2.2.1 Existing Developments

The Two-mile Canyon JMS AEI has existing development in the buffer area but none in the core area at this time. Developed areas in the buffer include LANL office buildings, light industrial areas, a 5 acre (2.02 hectare) running track, and roads. Development has occurred primarily on the mesa containing the LANL operation centers. There are some recreational trails and power lines in the buffer areas. There is no development in the core areas of this AEI.

5.2.2.2 Access

The mesa tops around this area have roads but the core areas of this AEI are not developed and no trails or roads enter the core area.

5.2.3 Recommendations and protective Measures

There are no other recommendations above and beyond the requirements of this site plan at this time.

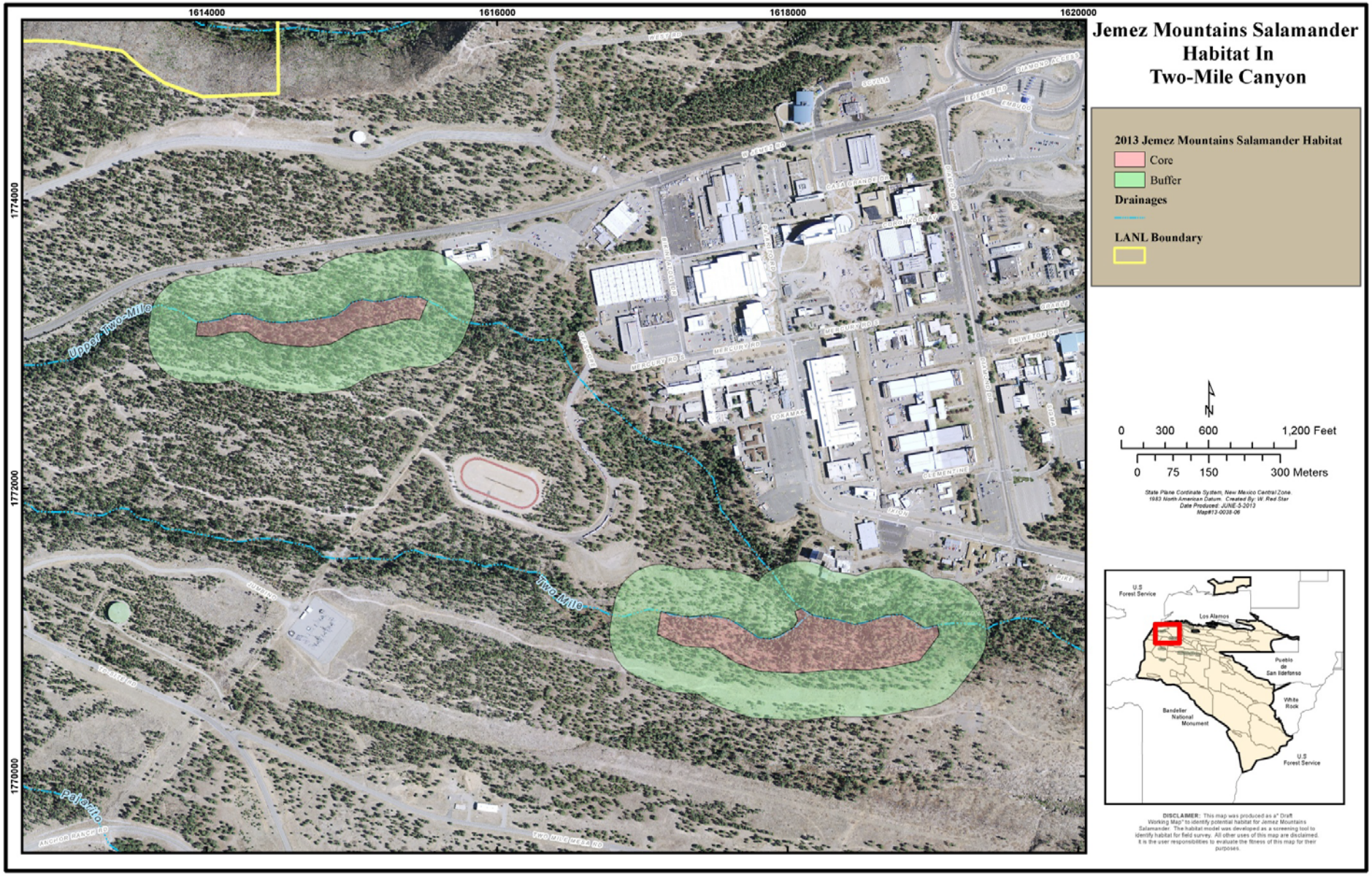

Figure 5. Two-mile Canyon Jemez Mountains Salamander Area of Environmental Interest

5.3 Pajarito Canyon JMS AEI

5.3.1 Environmental Description

5.3.1.1 Location

This AEI has four separate areas. They are located in Pajarito Canyon (Figure 6) in Los Alamos County, New Mexico. These areas are in TAs 9, 14, 15, 22, 40 and 67. The Pajarito Canyon JMS AEI is 186.03 acres (75.28 hectares) in size, with 40.6 acres (16.43 hectares) in the core and 145.43 acres (58.85 hectares) in the buffer.

5.3.1.2 Overlapping AEIs

All four sections of the Pajarito Canyon JMS AEI overlap with the Pajarito Canyon Mexican Spotted Owl AEI.

5.3.1.3 Vegetation

Table 3 describes the vegetation types present in this AEI based on the 1/4 hectare physiognomy cover classes land cover types in the LANL land cover map (McKown et al. 2003).

Table 3. Vegetation Types in the Pajarito Canyon Jemez Mountains Salamander Areas of Environmental Interest Core Habitat

Pajarito Canyon Land Cover Type	Total Acres in Core Habitat
Mixed conifer-Spruce-Fir Forest	32.93
Ponderosa pine Forest	5.89
Ponderosa pine-Mixed conifer Woodland	0.98
Aspen Forest	0.55
Pinon-Juniper Forest	0.31
Pinon-Juniper Woodland	0.01
Cerro Grande Fire high burn severity	0.01
Shrubland	0.01

5.3.2 Human Impacts

5.3.2.1 Existing Developments

The Pajarito Canyon JMS AEI has no developments in the buffer or core areas at this time. One transmission line passes over the upper end of the AEI.

5.3.2.2 Access

The core area of this AEI is not developed and no trails or roads enter the core area.

5.3.3 Recommendations and Protective Measures

There are no other recommendations above and beyond the requirements of this site plan at this time.

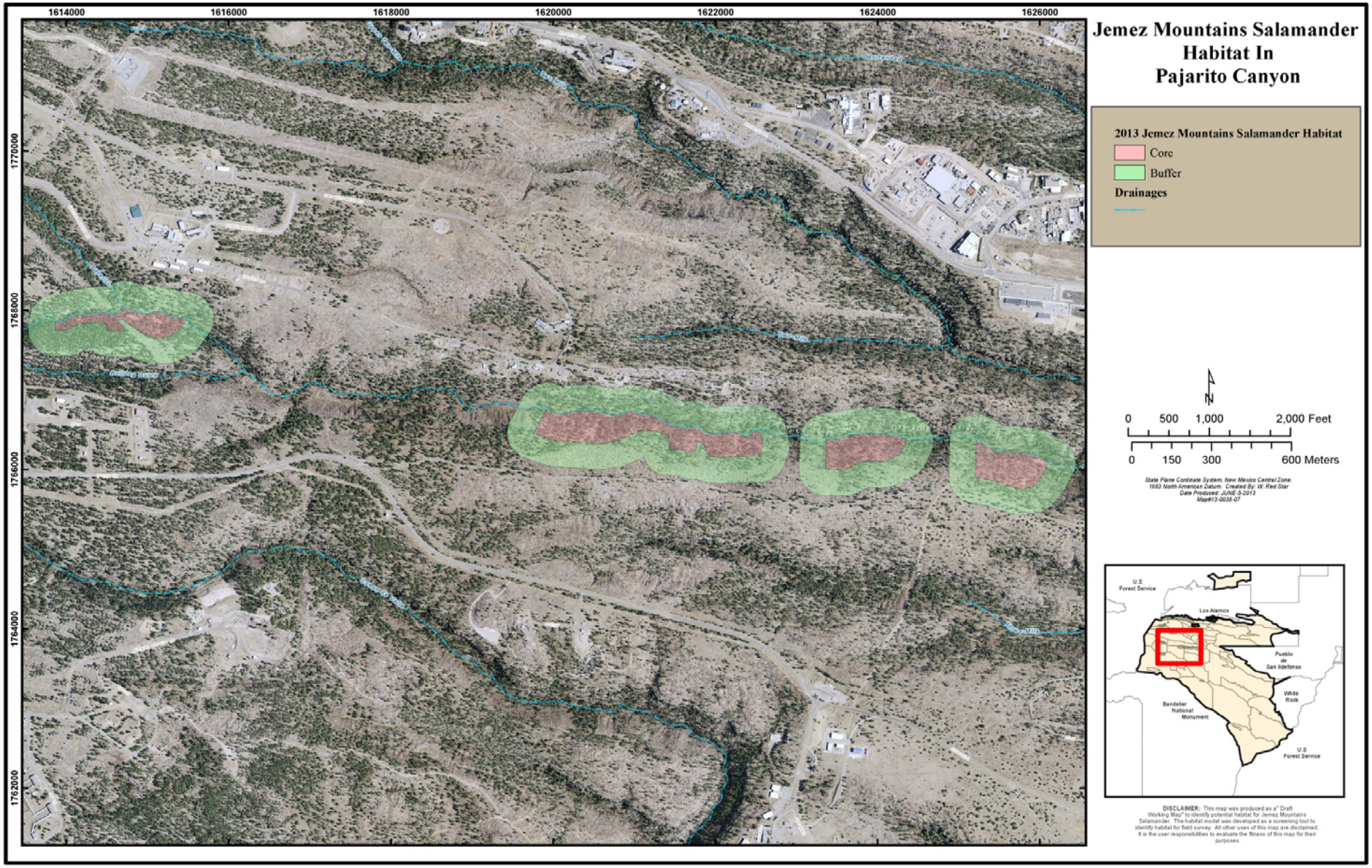

Figure 6. Pajarito Canyon Jemez Mountains Salamander Area of Environmental Interest

5.4 Cañon de Valle JMS AEI

5.4.1 Environmental Description

5.4.1.1 Location

This AEI has one small area. It is located in Cañon de Valle (Figure 7) in Los Alamos County, New Mexico. This area is TAs 9 and 16. The Cañon de Valle JMS AEI is 38.07 acres (15.4 hectares) in size, with 7.59 acres (3.07 hectares) in the core and 30.48 acres (12.33 hectares) in the buffer.

5.4.1.2 Overlapping AEIs

The AEI overlaps with the Cañon de Valle Mexican Spotted owl AEI.

5.4.1.3 Vegetation

Table 4 describes the vegetation types present in this AEI based on the 1/4 hectare physiognomy cover classes land cover types in the LANL land cover map (McKown et al. 2003).

Table 4. Vegetation Types in the Cañon de Valle Jemez Mountains Salamander Areas of Environmental Interest Core Habitat

Cañon de Valle Land Cover Type	Total Acres in Core Habitat
Mixed conifer-Spruce-Fir Forest	6.69
Ponderosa pine-Mixed conifer Woodland	0.90

5.4.2 Human Impacts

5.4.2.1 Existing Developments

The Cañon de Valle JMS AEI has existing developments in the buffer area but none in the core area at this time. Developed areas in the buffer include well pads and water wells, and dirt roads. There is no development in the core area of this AEI.

5.4.2.2 Access

The mesa tops around this area have roads but the core area of this AEI is not developed and no trails or roads enter the core area. A dirt road in the bottom of the canyon is near the core boundary.

5.4.3 Recommendations and Protective Measures

There are no other recommendations above and beyond the requirements of this site plan at this time.

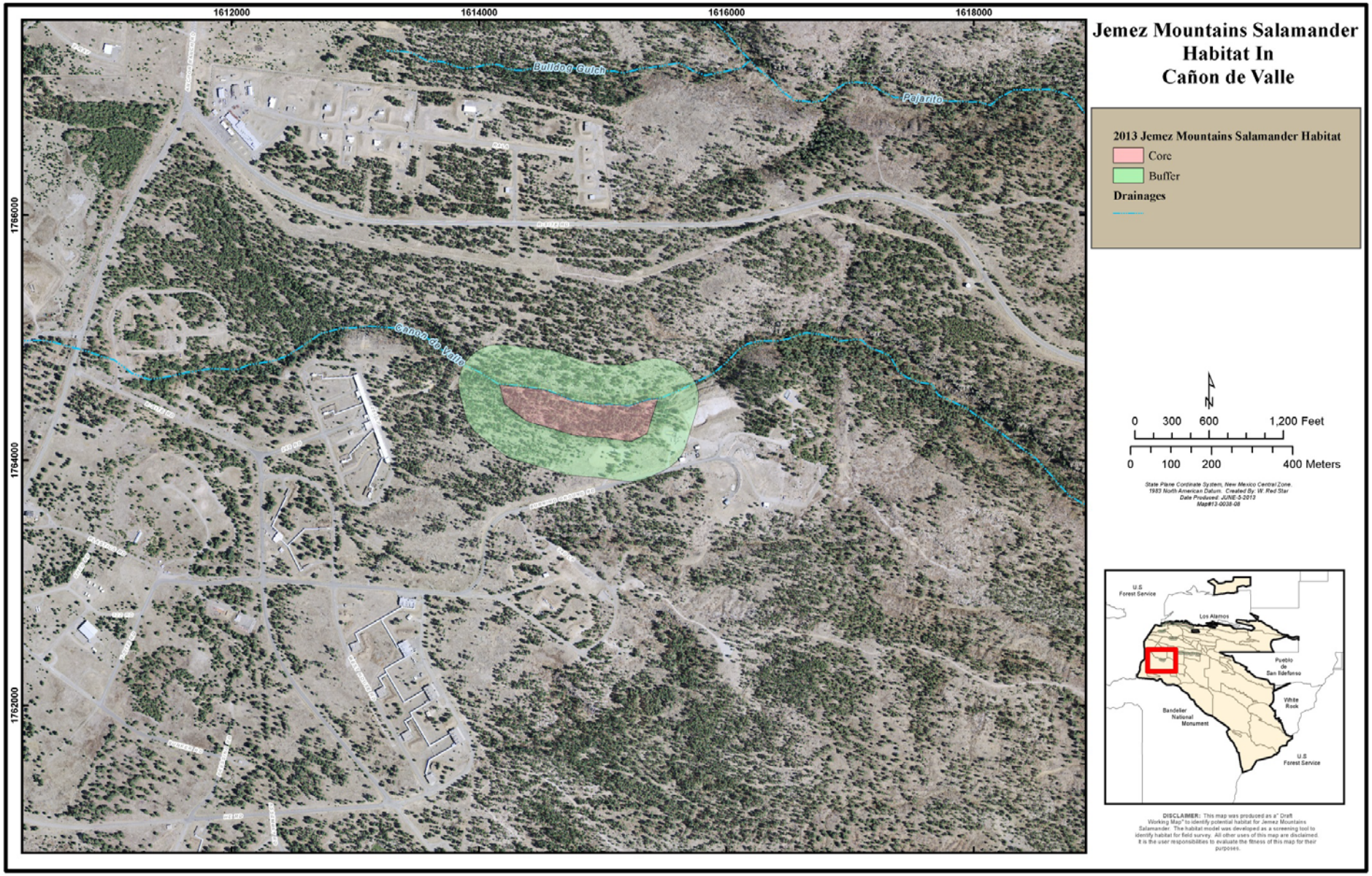

Figure 7. Cañon de Valle Jemez Mountains Salamander Area of Environmental Interest

5.5 Fenton Hill JMS AEI

5.5.1 Environmental Description

5.5.1.1 Location

This AEI is the footprint of the satellite facility known as Fenton Hill and the forest surrounding the facility. It is located off of New Mexico Highway 126 in the Jemez Mountains (Figure 8), in Sandoval County, New Mexico. This area is in TA 57. The Fenton Hill JMS AEI is 117.32 acres (47.47 hectares) in size, with 52.79 acres (21.36 hectares) in the core and 58.53 acres (23.68 hectares) in the buffer. The Fenton Hill site is leased land from the Santa Fe National Forest. The boundaries mapped in this site plan extend beyond the leased boundary in case future projects have a larger scope.

5.5.1.2 Overlapping AEIs

This AEI does not overlap any other AEIs.

5.5.1.3 Vegetation

A land cover map is not available for this location. The footprint of the facility is developed core and the forest surrounding the facility is a type of mixed conifer.

5.5.2 Human Impacts

5.5.2.1 Existing Developments

Most of the area in this AEI is considered developed core. Only the forested land outside the facility footprint is undeveloped and may contain JMS populations. However, during the rainy season between July – October (or when freezing temperatures begin, whichever comes first) when JMS move around on the surface and could be impacted by soil disturbance within the developed core. Developed areas in the core and buffer include LANL office buildings, light industrial areas, a large pond, and paved and dirt roads. There are also power lines and underground utilities such as water, sewer, etc.

5.5.2.2 Access

Access to this area is via New Mexico Highway 126 and dirt and paved roads within the facility.

5.5.3 Recommendations and Protective Measures

More surveys should be completed around this facility since future work is anticipated.

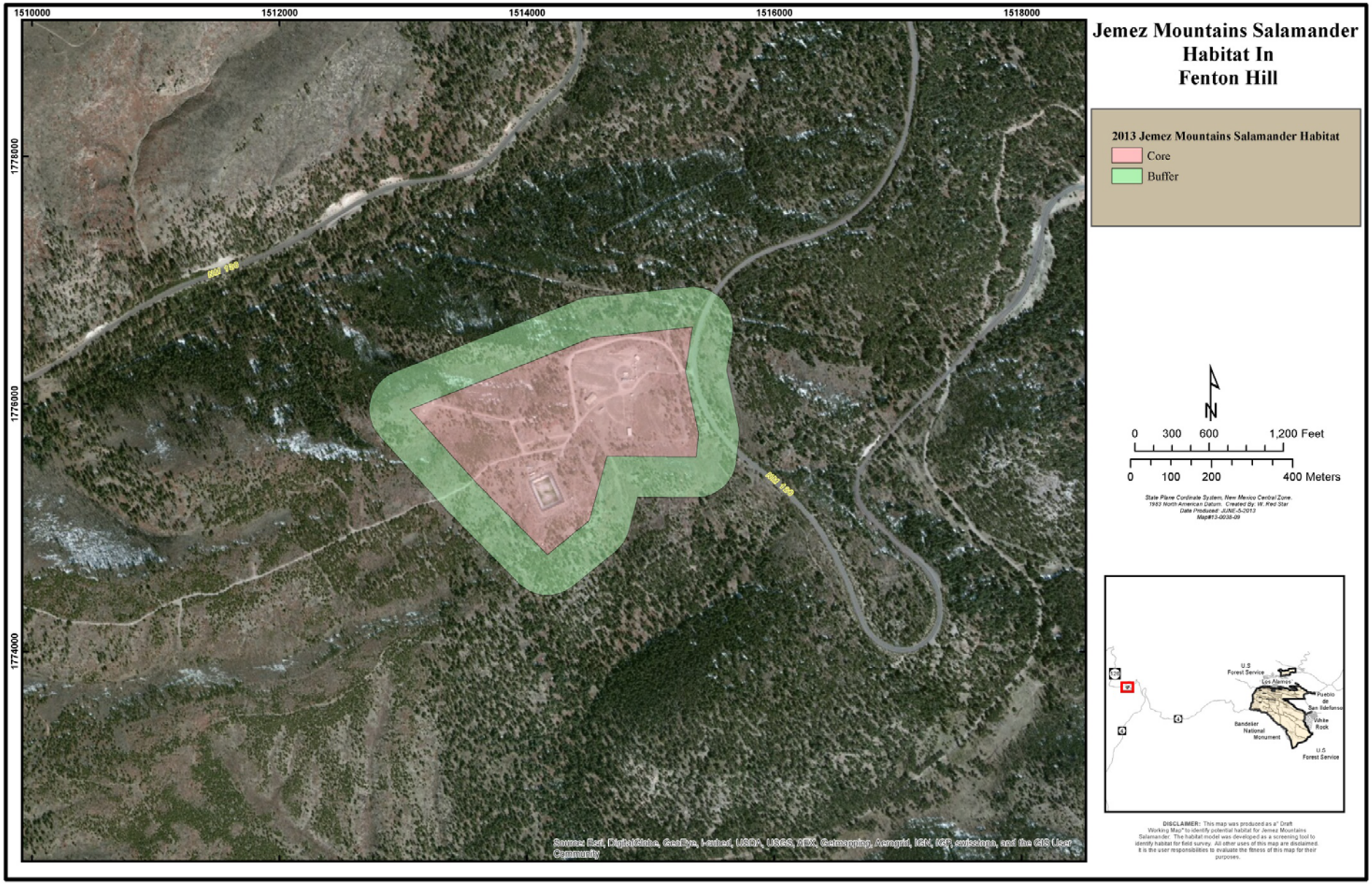

Figure 8. Fenton Hill Jemez Mountains Salamander Area of Environmental Interest

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