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Lawrence Livermore National Laboratory

Site 300 Explosive Test Facility

Prescribed Burn/Smoke Management Plan

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Revised March 2014

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Prescribed Burn/Smoke Management Plan Goals and Objectives

- Develop a smoke management plan consistent with California Air Resources Board's "Smoke Management Guidelines for Agricultural and Prescribed Burning" (CCR, 2001).
- Provide for the safety of employees, visitors, and neighbors during all phases of the wildland fire management process.
- Use prescribed fire and mechanically maintain and/or treat the Site's developed areas to reduce the threat of unwanted fire. Continue to maintain defensible space in accordance with National Fire Protection Association (NFPA) 1144, "Standard for Reducing Structure Ignition Hazards from Wildland Fire" around all critical facilities at Site 300.
- Meet the San Joaquin Valley Air Pollution Control District's (SJVAPCD) regulatory rules and policies as they pertain to prescribed burns and smoke management (SJVAPCD, 2001).
- Minimize the occurrences of fires that could leave the Site 300 boundaries and impact Lawrence Livermore National Laboratory's (LLNL's) neighbors.
- Manage and enhance plant biodiversity and wildlife habitat at Site 300 through the judicious use of prescribed fires.
- Conduct research on the effects of fire and the use of fire to enhance the habitat of the endangered large-flowered fiddleneck and/or big tarplant.
- Provide a fire-safe barrier to prevent wildfires from entering Site 300.
- Preserve and extend the capability to safely test explosives while protecting the environment.
- Minimize the occurrence of unnaturally intense fires by reducing the amount of vegetation that can fuel larger, more catastrophic fires.
- Limit the extent of prescribed fires, which would reduce the air quality for LLNL's neighbors.
- Provide opportunities for public understanding of fire ecology principles, smoke management, and prescribed fire program objectives.
- Use minimum impact prescribed burns and fire suppression techniques, and rehabilitate disturbed areas to protect natural and cultural resources from adverse impacts attributable to fire suppression activities.
- Conduct all fire management activities commensurate with applicable laws, policies, and regulations (DOE, 2014 and LLNL, 2013).
- Cooperate extensively with adjacent landowners to facilitate safe and prompt suppression of wildfires.
- Suppress all wildfires in accordance with recognized wildfire safety parameters to assure minimal impacts on the environment and cultural resources.
- Engender understanding among fire fighters about the impacts of fire suppression on sensitive resources. Cutting of all firebreaks, fuel reduction, and fire suppression will be done to minimize the impact on the ecosystem from soil erosion.

Description of Site 300 Burn Areas

LLNL Site 300 is located in the California Interior Coast Ranges, which is characterized by low rugged mountains and relatively narrow intervening valleys. It is situated 15 miles east of the Livermore Valley near the eastern edge of the Altamont Hills, close to the western boundary of San Joaquin County (**Figure 1**). Elevations range from 500 feet at the southern boundary to 1,800 feet at the higher peaks in the northwestern areas. Site 300 covers approximately 6,800 acres (about 11 square miles) of land in eastern Alameda County and western San Joaquin County. Site 300 was acquired in 1953; since then, all grazing and other agricultural activities have been terminated.

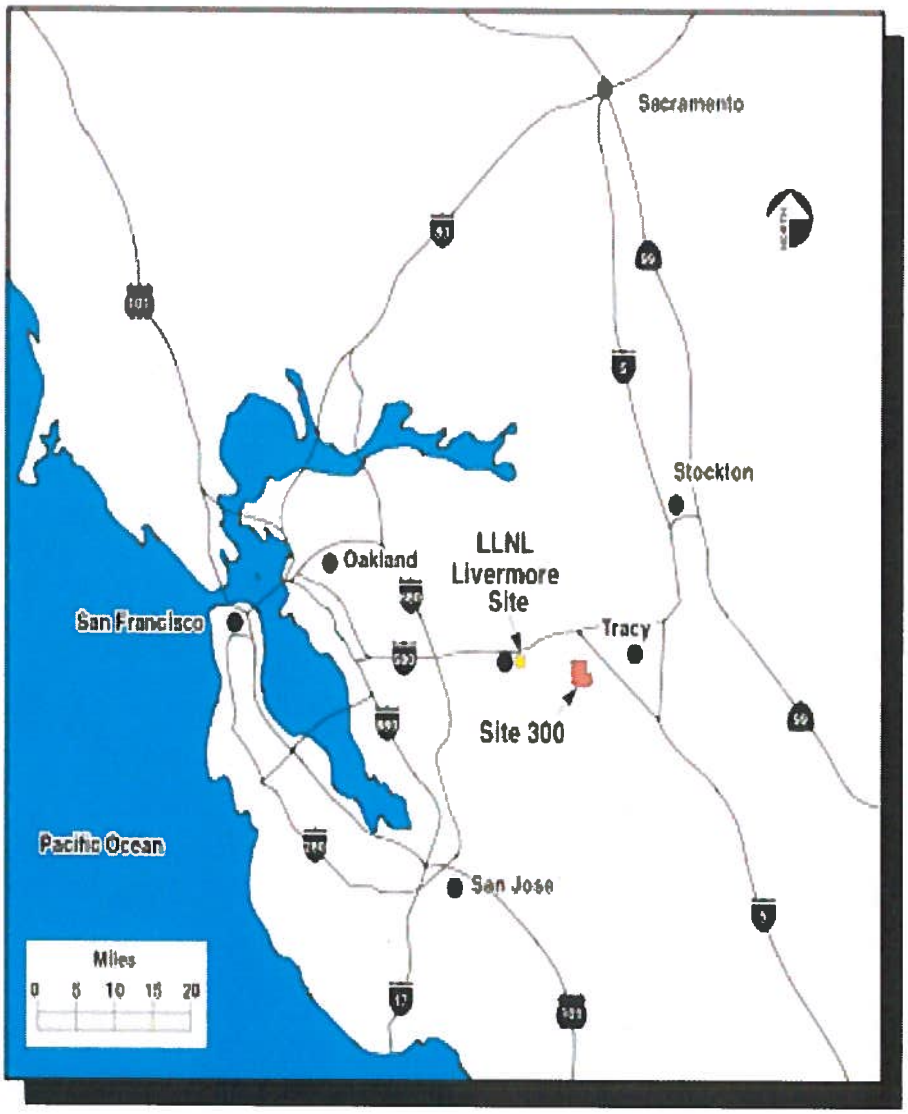


Figure 1. Location of Site 300

The 2,176.5-acre control burn area is divided into 24 plots ranging from less than 1 acre to 684 acres (see general map, **Figure 2**). A topographic map showing the specific burn areas is included herein as Appendix A. The fuel load within the control burn plots ranges between 0.74 and 1 ton per acre, depending on the grass height and distribution. Existing service roads, fire trails, and other barriers separate the plots. A combination of existing fire roads, temporary control lines, wet line firing methods, and other existing barriers isolate the plot perimeter boundaries.

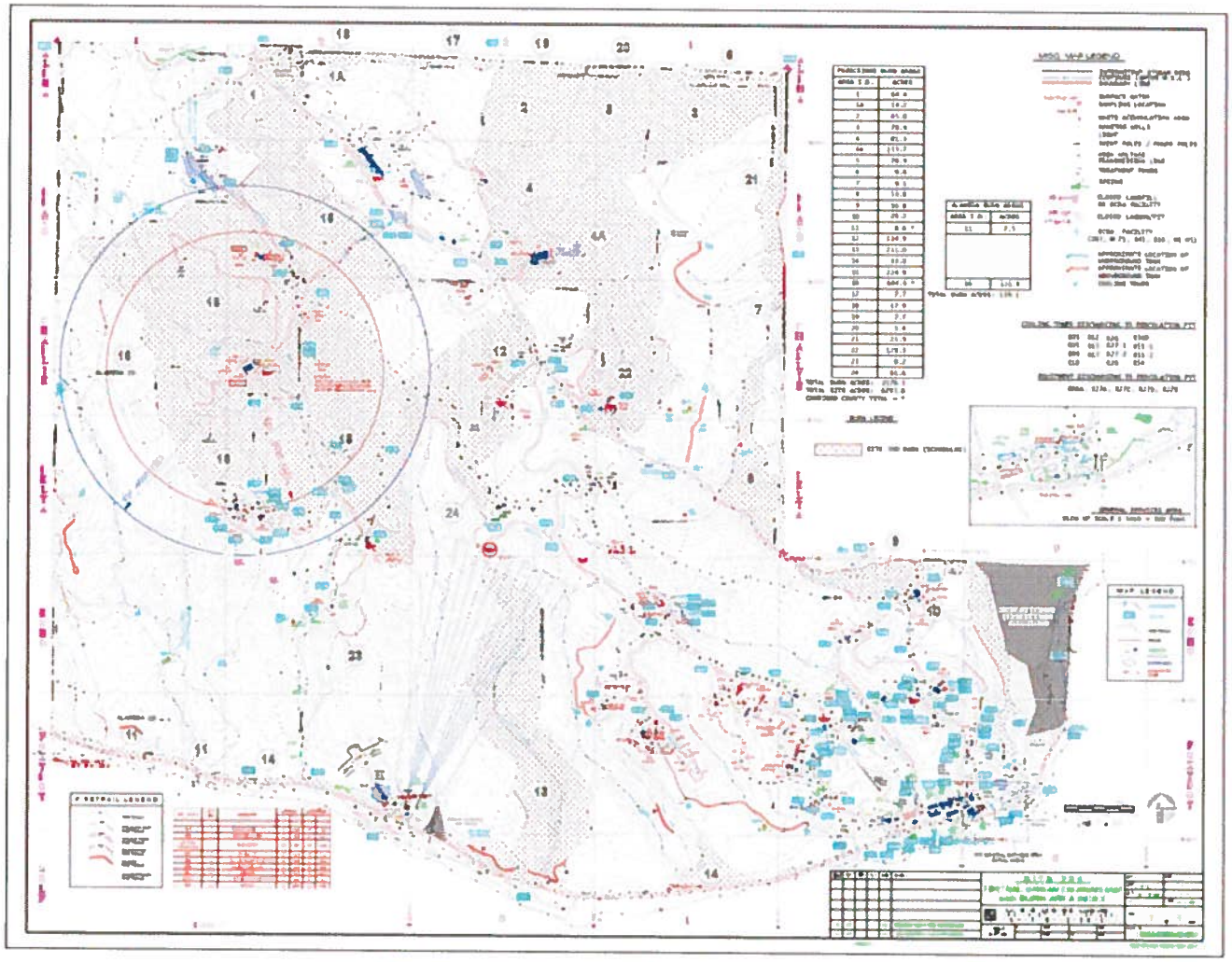


Figure 2. General Prescribed Burn Map – Site 300

Meteorology

Site 300's climate is normally characterized by mild, rainy winters and hot, dry summers. Sunshine is abundant throughout the year. It is officially classified as "Mediterranean Scrub Woodland" climate (DOE 1992). The mean annual temperature for the 30-year period, 1951 through 1980, was 14.5°C (58.1°F) with extremes ranging from –8°C (18°F) to 45°C (113°F). Almost all rainfall occurs between October and April. The average annual rainfall for the 38-year period (1959-1996) at LLNL Site 300 was 264 mm (10.4 in.).

LLNL's web-based weather pages provide access to local meteorological information and links to other weather-related sites. The Site 300 meteorological tower is located on a ridge near the northern border of the site. The base of the tower is about 1,200 feet above mean sea level (MSL).

Land Use

The principal land use at Site 300 is research and development. The land use categories are determined by the predominant activity within an area. The majority of the area at Site 300 is undeveloped or buffers a test area and is available for development for experimentation and testing purposes. Facilities and land used for experimentation and testing are grouped together to form Activity Areas. These include the General Service Area (GSA), Chemistry Area, Process Area, East Firing Area, West Firing Area, Physical Environmental and Dynamic Test Area, and the Pistol Range Area.

Many of the current uses represent facilities that have been physically separated because of the explosives safety stand off distances (arcs) required by the Department of Energy (DOE). Within these safety arcs, many experiments have continued with only minor modifications while intermittent explosive testing was conducted. This dual use of the area makes Site 300 both efficient and effective by accommodating multiple researchers in a location close to the Livermore Site.

Prescribed fires and suppression activities for all fires are done with recognized wildfire safety parameters to assure minimal impacts on the environment. These include avoidance measures for sensitive and protected species and habitats; potential pre- and post-fire surveys for impacts to sensitive species; protection of and post-fire evaluation of groundwater monitoring wells and groundwater remediation facilities and equipment; and watershed post-fire assessment and rehabilitation as necessary (e.g., sediment reduction, channel treatments) to stabilize biotic communities, and to prevent degradation of critical known natural and cultural resources.

Site 300 contains several habitat types and numerous special status species (e.g., threatened and endangered species, migratory birds, and rare plants) (see **Table 1**). These species have adapted over time to the periodic presence of fire in their ecological communities. Site 300 is home to the endangered large-flowered fiddleneck (*Amsinckia grandiflora*). The *Amsinckia grandiflora* Reserve was designated per a memorandum of agreement between DOE and the U.S. Fish and Wildlife Service (USFWS), and consists of 160 acres of Site 300, which is not included in the annual routine prescribed burn. However, the 1997 *Amsinckia grandiflora* Recovery Plan (USFWS 1997) calls for research into the use of controlled burns as a tool for large-flowered fiddleneck recovery. These are small research burns conducted as part of the coordinated effort

between DOE, Lawrence Livermore National Security, LLC, and the USFWS to enhance large-flowered fiddleneck recovery.

Table 1. Special Status Species at Site 300 as of 2014.

Special status wildlife and plants known to occur at Site 300 (does not include migratory bird species protected under the federal Migratory Bird Treat Act):

Mammals

Common Name	Scientific Name (2014)	Regulatory Status (2014)
American badger	*Taxidea taxus*	CASSC
Pallid bat	*Antrozous pallidus*	CASSC
Western red bat	*Lasiurus blossevillii*	CASSC

Birds

Common Name	Scientific Name	Regulatory Status
Burrowing Owl	*Athene cunicularia*	BCC, CASSC
Golden Eagle	*Aquila chrysaetos*	BGEPA CAFPS
Grasshopper Sparrow	*Ammodramus savannarum*	CASSC
Loggerhead Shrike	*Lanius ludovicianus*	BCC, CASSC
Northern Harrier	*Circus cyaneus*	CASSC
Short-eared Owl	*Asio flammeus*	CASSC
Swainson's Hawk	*Buteo swainsoni*	ST
Tricolored Blackbird	*Agelaius tricolor*	BCC, CASSC
White-tailed Kite	*Elanus leucurus*	CAFPS
Willow Flycatcher	*Empidonax traillii*	BCC, SE
Yellow Warbler	*Dendroica petechia brewsteri*	BCC, CASSC
Double-crested Cormorant	*Phalacrocorax auritus*	DFWWL
Osprey	*Pandion haliaetus*	DFWWL
Ferruginous Hawk	*Buteo regalis*	DFWWL
Cooper's Hawk	*Accipiter cooperii*	DFWWL
Sharp-shinned Hawk	*Accipiter striatus*	DFWWL
Prairie Falcon	*Falco mexicanus*	DFWWL
Allen's Hummingbird	*Selasphorus sasin*	BCC
Rufous Hummingbird	*Selasphorus rufus*	BCC
Costa's Hummingbird	*Calypte costae*	BCC
Nuttal's Woodpecker	*Picoides nuttallii*	BCC
Oak Titmouse	*Baeolophus inornatus*	BCC

Reptiles and Amphibians

Common Name	Scientific Name	Regulatory Status
Alameda whipsnake	*Masticophis lateralis euryxanthus*	FT, ST
California red-legged frog	*Rana draytonii*	FT, CASSC
California tiger salamander	*Ambystoma californiense*	FT, ST, CASSC
Coast horned lizard	*Phrynosoma blainvillii*	CASSC

Table 1. Special Status Species at Site 300 as of 2014 (continued)

Reptiles and Amphibians

Common Name	Scientific Name (2014)	Regulatory Status (2014)
San Joaquin coachwhip	*Masticophis flagellum ruddocki*	CASSC
Silvery legless lizard	*Anniella pulchra pulchra*	CASSC
Western spadefoot toad	*Spea hammondii*	CASSC
Coast Range newt	*Taricha torosa torosa*	CASSC
Pacific pond turtle	*Actinemys marmorata*	CASSC

Invertebrates

Common Name	Scientific Name	Regulatory Status
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	FT

Plants

Common Name	Scientific Name	Regulatory Status
Big tarplant	*Blepharizonia plumosa*	CNPS List 1B
California androsace	*Androsace elongata* ssp. *Acuta*	CNPS List 4
Diamond-petaled California poppy	*Eschscholzia rhombipetala*	CNPS List 1B
Gypsum-loving larkspur	*Delphinium gypsophilum* ssp. *gypsophilum*	CNPS List 4
Hogwallow starfish	*Hesperevax caulescens*	CNPS List 4
Large-flowered fiddleneck	*Amsinckia grandiflora*	FE, CNPS List 1B
Round-leaved filaree	*California macrophylla*	CNPS List 1B
Stinkbells	*Fritilaria agrestis*	CNPS List 4

Notes:

FE: Endangered under the Federal Endangered Species Act.
FT: Threatened under the Federal Endangered Species Act.
SE: Endangered under the State Endangered Species Act.
ST: Threatened under the State Endangered Species Act.
CASSC: California Species of Special Concern (CA. Dept. of Fish and Game 2001).
CAFPS: CA. Dept. of Fish and Game Fully Protected Species (CA. Dept. of Fish and Game 2001)
CNPS List 1B: California Native Plant Society – Plants rare, threatened, or endangered in California and elsewhere.
CNPS List 4: California Native Plant Society – Plants of limited distribution; a watch list.

** Although there are no recorded observations of San Joaquin kit foxes at Site 300, this species must be considered during environmental reviews at Site 300 because there are records of San Joaquin kit foxes in adjacent areas.

Routine prescribed burning at Site 300 has resulted in the establishment and maintenance of large stands of native perennial grasslands. These grasslands have become increasingly rare throughout California, having been displaced by exotic annual grasses introduced from the Mediterranean area. Prescribed burns are an important component in managing these communities. In addition, a number of species considered rare by the California Native Plant Society (CNPS) occur in the areas undergoing prescribed burns and appear to benefit from the reduced competition afforded by the burns. In particular, the big tarplant *(Blepharizonia*

plumosa), a plant considered extremely rare by the CNPS, occurs in these areas. Fire appears to be an important component in the life history of this plant. The role of fire in maintaining and managing the big tarplant and the large-flowered fiddleneck is being investigated.

Environmental Considerations

LLNL's environmental policy requires that all Laboratory operations be conducted in compliance with applicable governmental regulations and DOE Orders. A brief overview of the environmental considerations relating to existing land use is presented under the following topics.

Site 300 is inhabited by a diverse assemblage of flora and fauna. From its southern boundary within the Corral Hollow Creek floodplain, the property rises in a series of southeast-northwest trending ridges to nearly the northern perimeter. Several ephemeral streams flow through Site 300 during the wet winter months and discharge into Corral Hollow Creek at the southern boundary of the site. Most flow is direct run-off with a very small contribution from both intermittent and perennial springs.

Biota and Endangered Species

Less than 5% of Site 300's approximate 7,000-acre property is developed. Developed areas with buildings are generally separated from wildland settings with high-security fences, and very few of these complex areas provide habitat for native flora and fauna (**Figure 2**).

The most common vegetation types found at Site 300 are introduced grassland, native grassland, coastal sage scrub, and oak woodlands. All of these habitats are believed to have evolved with fire (Menke 1992, Huenneke and Mooney 1989, Barbour and Major 1990). The introduced grassland community covers about 5,533 acres (roughly 80% of the site) with variously proportioned mixtures of introduced annual grasses; the most important species are slender wild oat (*Avena barbata*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and red brome (*Bromus madritensis*).

The native perennial grassland community is dominated by pine (one-sided) bluegrass (*Poa secunda*) and purple needlegrass (*Nassella pulchra*) and covers about 447 acres (6.7% of the property). Stands of native grasslands are confined mainly to the northern half of the facility. Occurrence of native grass-dominated vegetation appears to be associated with annual controlled burning. There is concern that the reduction in acreage burned at Site 300 in recent years may result in a contraction of the native grassland community at the facility.

A major vegetation community, coastal sage scrub, occurs in the southwestern part of the site and covers approximately 228 acres (3.3% of the site). It contains four dominant shrubs: California sagebrush (*Artemisia californica*), California buckwheat, (*Eriogonum fasciculatum*), black sage (*Salvia mellifera*), and matchweed (*Gutierrezia californica*). The oak woodland community is restricted to the north-facing slopes in the southern canyons and covers approximately 56 acres (<1% of the property). The oak woodland community includes a sparse cover of blue oak with an understory predominantly of three exotic grasses: slender wild oat, soft chess, and ripgut brome. Other less common vegetation communities are seeps and springs, seasonal pools, northern riparian woodland habitat, and four localized upland plant communities.

Eight rare floral species occur at Site 300. The federally listed endangered large-flowered fiddleneck occurs within the *Amsinckia grandiflora* Reserve. The diamond-petaled California poppy (*Eschscholzia rhombipetala*), round-leaved filaree (*California macrophylla*), and big tarplant are included on the CNPS list 1B and have been found to occur at Site 300. Three small populations of the diamond-petaled poppy (from 30 to 700 plants) occur in the western portion of the site, near Draney Canyon. Annual monitoring of this species is ongoing. The big tarplant is quite widespread throughout Site 300. Mapping of this species suggests the larger populations appear to be associated with the annual controlled burn. The gypsum-loving larkspur (*Delphinium gypsophilum ssp. gypsophilum*, CNPS List 4) occurs in several localized areas at Site 300. Stinkbells (*Fritilaria agrestis*) and hogwallow starfish (*Hesperevax caulescens*) are CNPS List 4, species that occur in several locations in the northern portion of the site. California androsace (*Androsace elongata ssp. acuta*), the round-leaved filaree, and the gypsum-loving larkspur all occur within areas undergoing prescribed burns.

Isolated wetland habitats consist of northern riparian woodland, seasonal pools and herbaceous wetlands. The Federally Threatened California red-legged frog (*Rana aurora draytonii*) and Federal- and state-threatened California tiger salamander (*Ambystoma californiense*) occur at Site 300 in association with some of the wetlands. All of Site 300 is currently designated federal Critical Habitat for the California red-legged frog.

The blue elderberry bush (*Sambucus mexicana*) is present at numerous remote locations at Site 300; this plant species is known to be the host plant to the federally threatened valley elderberry long horn beetle (*Desmocerus californicus dimorphus*). These beetles were discovered in the summer of 2002 in the eastern portion of the property and are suspected to occur elsewhere on site. None of the blue elderberry bushes currently exist in the annual prescribed burn area.

The federally-threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) is highly associated with coastal sage scrub habitat. The Alameda whipsnake critical habitat and majority of suitable habitat is located in the southwestern quadrant of the site.

Air Quality

SJVAPCD is currently designated as non-attainment for the federal PM 2.5 particulate emission standard and as extreme non-attainment for the federal ozone standard. The major air pollutant of concern from the fire is smoke. Other pollutants such as nitrogen oxides, volatile organic compounds and carbon monoxide are also produced from fire. The SJVAPCD is concerned that prescribed burning is contributing to the non-attainment status for particulate emissions. Smoke is made of a complex mixture of carbon, tars, liquids, and different gases. These smoke particles range in various sizes from less than 2.5 micrometers to 10 micrometers. The relative proportion in which each size particle is generated is often determined by the rate of energy release of the fire. High intensity fires tend to be bimodal with peaks near 0.3 micrometers and in excess of 10 micrometers. The smaller the smoke particle size, the greater the opportunity for health effects as the particle is breathed further into the lungs. Emission of smaller smoke particles occurs as a result of frequent and periodic burns.

The Site 300 annual prescribed burn is scheduled to occur when the grass is dry enough to sustain a burn, usually in the May-June timeframe. Because the amount of fuel consumed depends on the moisture content of the fuel, the timing of the burn also minimizes the amount of

smoke released from the burn. These burns occur only during daylight hours and under authority of the air district. During the summer of 2005, the LLNL burns partially prevented the spread of a widespread grassland fire, believed to be started by an arsonist.

Environmental Impact of Prescribed Burns

Site 300 has been conducting prescribed burns throughout its history for wildfire control. According to the "2005 Final Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement" (SWEIS) (DOE 2005), the development of stands of native grassland is strongly correlated with the burn area, and no riparian, wetland, or sage scrub habitats are affected by the burning activity. All designated burn areas of the site have been burned at least once since 1960. The southern half is more devoted to site operations.

National Environmental Policy Act

The DOE's principal vehicle for compliance with the National Environmental Policy Act (NEPA) at LLNL and Site 300 is the "2005 Final Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement." California Environmental Quality Act (CEQA) compliance is addressed by the 1992 Final Environmental Impact Statement and Environmental Impact Report EIS/EIR and the 1997 Environmental Impact Report Addendum (see http://www.envirinfo.llnl.gov.) These NEPA compliance (EIS) and CEQA compliance (EIR) documents were prepared to analyze the impacts of the proposed action of continued operation of LLNL and Site 300.

Prescribed burning is discussed in these documents appropriate to the context, including safety, environmental impacts and wildfire prevention, Site 300 testing requirements, natural resource impact, and potential impact to neighbors and planned adjacent communities. NEPA reviews occur through annual pre-burn meetings attended by LLNL's Environmental Stewardship, Planning and Monitoring Program (responsible for NEPA compliance) and preparation of formal evaluations as to the adequacy of the EIS/EIR documents if a given burn varies from impacts previously evaluated.

Biota and Endangered Species

Prescribed burning at Site 300 has had a net positive effect on vegetation communities. The 2005 SWEIS states the following regarding the environmental evaluation of burning done in the context of the Site-wide NEPA review:

> "Native grassland communities on Site 300 occur almost exclusively in areas with annual prescribed burning, and researchers have previously noted that frequent fire is required to establish and maintain grasslands dominated by native grasses in lowland California (Barry 1972, BioSystems 1986a, Heady 1972). These annual prescribed burns may have an additional beneficial impact by reducing the presence of certain invasive plants, such as yellow starthistle (Lass et al 1999, Pollack and Kan 1998)."

Further, the 2005 SWEIS states that the annual controlled burning program on Site 300 would continue to benefit multiple species and to maintain and promote habitat diversity.

As previously discussed, the 1997 *Amsinckia grandiflora* Recovery Plan (USFWS 1997) calls for research into the use of fire to establish and maintain a more favorable habitat for the large-flowered fiddleneck. Previous research at Site 300 on the large-flowered fiddlenck has shown the native bunch grass habitat to provide a more favorable matrix for the large-flowered fiddleneck (Carlsen et al. 2000). In addition, ongoing work at Site 300 on the big tarplant suggests that a complex interaction with fire is required to maintain the metapopulation structure of this species (Carlsen et al. 2001).

Fire has been one of the primary forces that created and maintained biodiversity and specialized wildlife habitats throughout Central California (DOE 1992). Site 300 ecological communities have evolved in association with fires, and in fact, require fire for proper growth and health (DOE 1992). Just as many native plants exhibit adaptations that enable them to recover vigorously after a burn, endemic animal life history patterns also display strategies for taking advantage of and surviving periods of fire successfully (DOE 1992).

Historic patterns of local landscape fires created a mosaic of burned and unburned terrain. Fires in the Altamont Pass were frequent and driven by strong maritime winds originating from the San Francisco Bay. Heavy fuel accumulation in these predominately grassland ecosystems was unusual and rare (DOE 1992).

Native species, in general, exhibit specialized and adaptive lifestyles to survive the element of fire on the property. Many species cope with the adverse environmental conditions by retreating into their subterranean dens. Primary excavators (i.e., coyote [*Canis latrans*], American badgers [*Taxidea taxus*], ground squirrels [*Spermophilus beecheyi*]), or those species that inhabit the burrows of other excavators (i.e., California tiger salamanders [*Ambystoma californiense*], California red-legged frog, San Joaquin coachwhip [*Masticophis flagellum*], and burrowing owls [*Athene cunicularia*]) may escape the impacts of fire by sheltering themselves underground. Similarly, open habitat benefits the abundant bird-of-prey populations found at Site 300.

It is a misconception that many animals are killed by fire. Wildlife usually escapes by fleeing the area, hiding underground, or moving to adjacent unburned areas until the fire has passed. Both above- and below-ground surveys have been performed (1994-2002) immediately following the impacts of the prescribed burns. No fatality of any special-status species has been observed onsite (J. Woollett pers. obs.). Landscape alteration appears to be the net primary effect of these burns, not wildlife mortality.

Air Quality and Best Available Control Measures

Prescribed burns conducted at Site 300 are considered a long-term asset to air quality as they reduce the potential for destructive wildfires. In addition, the fires remove potential airborne residues that accumulate such as pollen and other respirable matter.

Fire management practices conducted at Site 300 minimize the impact of smoke on air quality through the following Best Available Control Measures:

- Fires are only conducted on days approved for burning by the presiding air district.

- Fires are only conducted in daylight hours, at temperatures under 100 degrees Fahrenheit, and at average wind speeds not exceeding 20 mph during the burn.
- The vegetation is determined to be dry enough to sustain a complete burn.
- Fires are ignited by air district-approved methods.
- Fires are managed in strict adherence to a Smoke Management Plan approved by the air district.
- Smoke emission and behavior are visually monitored.
- Fires are not allowed to smolder after the area has been burned.

Scheduling

Proposed Ignition Dates: May 1 – August 1, 2014.

In an effort to minimize daily and cumulative air quality impact to the regional area, each burn occurring in San Joaquin County will be scheduled in coordination with the SJVAPCD; burns occurring in Alameda County will be scheduled with the Bay Area Air Quality Management District (BAAQMD). The project area is divided into plots to facilitate fire management and control (Appendix A). Under favorable conditions, it is estimated that the entire project could be completed in ten (10) full days. However, due to weather conditions, burn day approval, acreage allocations, spare the air days, resource availability, staffing, and DOE approval, the project usually takes longer and may be completed by burning over a series of days that may or may not be consecutive. Plots that are not burned during the same day will be treated as separate burns through the regulatory notification process.

All prescribed burns will be conducted only on burn days approved by the presiding air district and during favorable meteorological conditions.

Media Coordination and Public Notification

The Public Affairs Office (PAO) at LLNL notifies neighbors and nearby residents of Site 300 of the intent to perform the annual burn project in advance of burn activities. This notification is conducted by mail and web using current contact information. LLNL points of contact are provided along with the PAO's Environmental Community Relations (ECR) representative so individual questions/concerns can be addressed, e.g., specific timing for individual burn areas. In addition, a public notice is prepared and distributed to local media (e.g., Tracy Press, Stockton Record, and Tri-Valley Times) prior to the burn. The contact information telephone numbers allow for receiving and addressing complaints after the burn. However, there have been few smoke-related complaints received during LLNL's recent burns.

The Alameda County Regional Emergency Communications Center will notify the following agencies/personnel on the morning of the burn:

- National Nuclear Security Administration, Livermore Field Office – (925) 422-0758
- SJVAPCD – (209) 557-6442
- BAAQMD – (415) 749-4979 (only on days of burns in Alameda County)
- California Department of Forestry, Emergency Communications Center – (408) 779-2121
- Alameda County Fire Department fire stations in eastern Alameda County – (925) 447-6611

- Site 300 /LLNL CAS operators – (925) 423-5222 and (925) 422-7222
- SRI – (925) 243-8710
- Fireworks America – (925) 449-1023
- San Joaquin County Fire Dispatch – (209) 464-4648
- Tracy Fire Department – (209) 831-4700
- Site 300 Environmental Oversight and Special Projects Manager – (925) 423-9136
- LLNL PAO – (925) 423-3125
- Carnegie State Vehicular Recreation Area – (925) 447-0426

Fire Management Strategies

Prescribed burning is used as a measure to prevent fires from entering or leaving Site 300. The prescribed burn provides a firebreak, which a wildfire should not breach. Winds are usually out of the west. As such, fire activity will burn in an easterly direction to the fire trails and fire breaks on the east boundary.

In the unlikely event that a prescribed fire leaves Site 300 and enters a neighbor's grazing land, it is expected that it would be extinguished with the resources described herein. Lands that border Site 300 on the west, east, and north are used for cattle grazing. These grasses are very similar to those found at Site 300, with the exception of the grass height. Grasses that have been grazed are usually less than three inches tall and will not support a credible fire spread. In order for a wildfire to reach a populated area, a fire would have to burn unchecked for a distance of approximately nine miles, through the grazed grass, jump Interstate 580, jump two aqueducts, and burn through fields of irrigated crops before reaching the City of Tracy. The Site is bounded to the south by Corral Hollow Road and the Carnegie State Vehicular Recreation Area.

A full range of alternatives to burning has been considered, all of which modify approved land use, destroy wildlife habitat, create erosion, or are unsafe. Those alternatives include:

- Grazing,
- Sterilization,
- Planting fire resistive, non-native vegetation,
- Disking, and
- Mowing.

LLNL contracts with the Alameda County Fire Department to provide emergency response services for fire, emergency medical, technical rescue, and hazardous materials incidents on LLNL property. The Alameda County Fire Department staffs both LLNL fire stations with security cleared, trained, firefighters and firefighter/paramedics. The primary fire suppression responsibility for the area described in this document lies within the jurisdiction of Alameda County Fire Station 21 (formerly LLNL Fire Station 2). Response is also provided from Alameda County Fire Station 20 (formerly LLNL Fire Station 1). The response is supported by a strong secondary response from the City of Tracy, all the Alameda County fire departments, and the California Department of Forestry and Fire Protection (CAL Fire). Mutual aid agreements between the various agencies have been in place since 1960. A Mutual Threat Zone Agreement is also in place with CAL Fire. This agreement provides aircraft, helicopters, and air

command aircraft in addition to their basic response of eight engines, two bulldozers, and a battalion chief.

Smoke Dispersal Model

The National Atmospheric Release Advisory Center (NARAC) at LLNL conducted smoke dispersion simulation modeling to better understand the atmospheric dispersion of smoke from prescribed burns at Site 300, and to examine how smoke behavior might differ for different burns and burn-plot terrain. The report on the simulations is entitled "Smoke Dispersion Simulations for Prescribed Burns at Site 300, Lawrence Livermore National Laboratory." A summary of the report, "Smoke Dispersion Model Report Summary," was presented as an appendix in the 2003 "Prescribed Burn/Smoke Management Plan."

Burning Prescription, Meteorological Conditions, and Smoke Management

Weather Prescription

	Range	Optimum
Temperature (F)	55–100	80
Relative Humidity %	20–75	35
Wind Speed (mph)	0–20	15
Wind Direction	All	NW

Fuel Type and Amount

The fuel loading for the project is ungrazed annual grassland estimated to be between 0.74 and 1 ton per acre.

Vegetation Type	% of Unit	Fuel Model Albini (1976)	Fuel Model NFDRS
Annual Grass	100%	1	A

Ignition Operations

At the beginning of each burn day, a small test ignition at the burn site will be conducted with a drip torch to observe ignition combustion rates and smoke behavior. Fire behavior and smoke conditions will be visually monitored to achieve compliance with the conditions set in the burn plan. All conditions, including the burn prescription, will be satisfied before the Incident Commander makes a decision to continue burning.

Ignition operations will be conducted using those set forth in the Alameda County Fire Department Procedure: Site 300 Prescribed Burn. Strip firing, head firing, and backing fire ignition patterns will be used to ignite the plot. Firing patterns and directions could change depending on safety, wind direction, other weather parameters, or smoke management concerns.

Duration of project ignition will last approximately 15 minutes to 2 hours for each plot. Combustion and burn-down time are minimal due to the light flashy fuels.

Smoke Management
Smoke volume from the project should not have a significant impact upon the surrounding communities. Due to the proximity of Corral Hollow Road, the southernmost perimeter trail along Corral Hollow Road is expected to be burned during non-commute hours (between 0900 hours and 1400 hours). Winds from the north occasionally create decreased visibility hazards along Corral Hollow Road; these hazards can be minimized by partial closures and postings on the road.

Smoke emission and behavior will be visually monitored on a continual basis. Any significant change in smoke emissions and/or column behavior will be reported to the Incident Commander. The Incident Commander will manage the project in a manner that will minimize impact to sensitive areas and the public. The project size, firing tactics, and burn duration will be adjusted to meet these goals.

Smoke Intrusion Contingency Plan
This project will be conducted in a manner that will avoid smoke intrusion into any smoke sensitive area. In the event a smoke intrusion does occur in a smoke sensitive receptor, the following actions will be taken to reduce smoke production, if appropriate:

- Reduce the size of the burn plot by developing new control lines,
- Suppress active fire,
- Initiate mop-up operations,
- Focus suppression and mop-up operations on areas of greater smoke production,
- Contact the LLNL Public Information Officer,
- Notify the affected populations, and
- Resume burn, if favorable conditions return.

Personnel and Equipment Protection
All burns will be conducted with personnel and equipment as set forth in the Alameda County Policy: Site 300 Prescribed Burn.

A minimum of ten (10) chief officers, captains and firefighters will be present at all burns.

Staffing

1	Incident Commander	Chief Officer of Captain
1	Safety Officer	Chief Officer or Captain
2	Division Officers	Captains or Acting Captains
2	Torch Company Officers	Captains or Acting Captains
2	Torch Persons	Firefighters
2	Observation Personnel	Firefighters

Equipment

1	Command Vehicle
4	Type 3 or 4 Engines

Monitoring and Evaluation Procedures
At 0645 hours on the day of the burn, the Fire Captain at the Alameda County (ALCO) Fire Station 21 will log onto the LLNL web page at www-metdat.llnl.gov and select the "Site 300" link under the "Current Conditions" heading to obtain the current weather at Site 300. From there, the Fire Captain can click the "Expanded" link next to "Instruments" in the upper right corner to review the following (click on the plot icon to review plot charts):

- Air Temperature,
- Dew Point,
- Peak Wind Gust,
- Relative Humidity,
- Wind Direction, and
- Wind Speed.

Additional weather readings will be obtained at the site of the burn with portable instrumentation (Kestrel 4000). During the burn, on-site monitoring will be conducted and the Incident Commander will observe weather, smoke, and fire behavior.

On the day of the burn, the Fire Captain at ALCO Fire Station 21 will enter the following into the incident report for the controlled burn:

- Staffing and positions,
- Duration of burn,
- Plots burned,
- Weather as captured at the start of the burn, and
- Total acreage burned for the day.

Public and Personal Safety
All burn personnel will wear full standard wildland fire fighting and safety equipment at all times. All standard wildland fire fighter safety rules will be strictly enforced.

The Incident Commander will appoint a safety officer to oversee the entire operation.

Effective communications shall be maintained throughout the incident, especially between the Divisions and Torch Companies.

Escaped Fire Contingency Plan
All ignition operations will stop if spotting or slop-over occur. The Incident Commander will supervise initial attack.

The burn will be declared a wildfire if resources, not assigned to the burn, are requested and/or the resources on scene are unable to contain the escape.

Should the burn become a wildfire, the Incident Commander will make a declaration of escape. The Incident Commander will immediately notify the emergency dispatch center and request wildland alarms as specified in the Mutual Aid Plan.

All division supervisors will provide and ensure the safety of ALL personnel assigned to them prior to the escape. All personnel will be assigned holding or suppression duties.

Primary and secondary holding lines will be identified on each project map. Water sources (hydrants, drafting areas, etc.) will also be identified on the project map.

Briefing Guide and Go/No-Go Checklist

- SJVAPCD has declared it a burn day (for burns conducted in San Joaquin County).
- BAAQMD has declared it a burn day (for burns conducted in Alameda County).
- All required notifications have been made.
- Current and forecasted weather are favorable.
- All applicable burn prescriptions are met.
- All required fire apparatus and equipment is in position and working properly.
- All personnel required in burn plan are on site and fire ready.
- All personnel are briefed on burn plan objectives, strategy, and tactics.
- A safety briefing has been given to all participating personnel.
- A test fire will be conducted before initiating ignition operations.

Contact Information

Contact	Organization	Office Phone	24-Hour Phone
John A. Sharry	LLNL Emergency Management	(925) 423-1802	(925) 518-5481
Randy Carter	Alameda County Fire Dept. Incident Commander Controlled Burn Operations	(925) 422-4250	(925) 422-7595 (Emergency Dispatch)
Duty Chief	Alameda County Fire Dept.	(925) 423-1810	(925) 422-7595 (Emergency Dispatch)
Scott Wilson	LLNL Public Affairs Office	(925) 423-3125	(925) 422-7595 (Emergency Dispatch)
Dawn Chase	Site 300 Manager's Office	(925) 423-9136	(925) 422-7595 (Emergency Dispatch)
John E. Scott	Site 300 Manager's Office	(925) 423-5026	(925) 422-7595 (Emergency Dispatch)

References

Barbour, M. G. and J. Major, editors, 1990. Terrestrial vegetation of California. California Native Plant Society, Sacramento, California.

Bradley, M. M., et al., 2002. Smoke Dispersion Simulations for Prescribed Burns at Site 300. Lawrence Livermore National Laboratory, Livermore, CA.

Bradley, M. M., 2002. Smoke Dispersion Model Report Summary. Lawrence Livermore National Laboratory, Livermore, CA.

Carlsen, T. M., J. W. Menke, and B. M. Pavlik, 2000. Reducing competitive suppression of a rare annual forb by restoring native California perennial grasslands. *Restoration Ecology* 8(1): 18–29.

Department of Energy, 2012, O-420.1C "Facility Management."

Department of Energy and University of California, 2005. Final Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement, Livermore, CA.

Department of Energy and University of California, 1992. Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore, CA.

Huenneke, L. F. and H. A. Mooney, ed., 1989. Grassland structure and function: California annual grassland. Tasks for Vegetation Science 20. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Lawrence Livermore National Laboratory, 2013. "Wildland Fire Management Plan," Rev 3.0.

Menke, J., 1992. Grazing and fire management for native perennial grass restoration in California grassland. Fremontia 20 (2):22-25.

Paterson, L., Espeland, E., Carlsen, T., 2005. Rare Plant Management at Lawrence Livermore National Laboratory Site 300 Project Progress Report Fiscal Years 2003 & 2004, October 1999-September 2000. Lawrence Livermore National Laboratory, Livermore, CA. In preparation. UCRL-AR-142408-03104

San Joaquin Valley Air Pollution Control District, 2001. Rule 4106 "Prescribed Burning and Hazard Reduction Burning."

Title 17 California Code of Regulations, Subchapter 2, 2001. "Smoke Management Guidelines for Agricultural and Prescribed Burning", Sections 80100-80330.

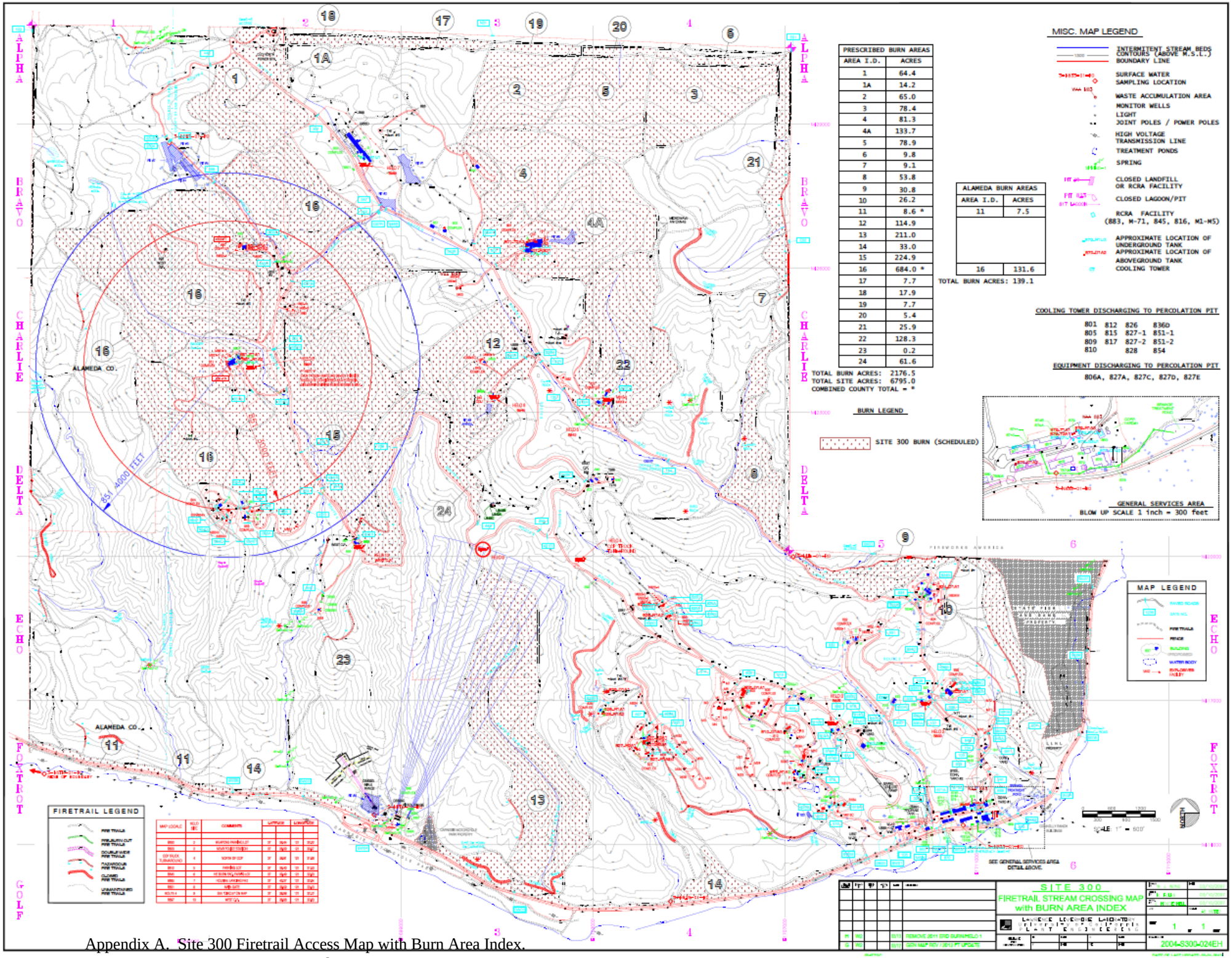
U. S. Fish and Wildlife Service (USFWS), 1997. Large-flowered Fiddleneck (*Amsinckia grandiflora*) Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon.

Woollett, J. S. and W. A. Diebner, 2003. Site 300 Experimental Test Site Amendment to the Site 300 Experimental Test Site Prescribed Fire Plan 2003 for the Alameda Whipsnake Research Area. Lawrence Livermore National Laboratory, Livermore, CA.

Woollett, J. S., 1995–2003. Personal Observations From Post-burn Mortality Surveys, 1995–2003.

Appendix A

Fire Trail Access Map With Burn Area Index



Appendix A. Site 300 Firetrail Access Map with Burn Area Index.

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