INFORMATION HANDOUT

For Contract No. 01-262024
At 01-Men-101-45.0/50.8

Identified by
Project ID 0112000202

MATERIALS INFORMATION

LOCATION MAP - PROJECT ACCESS

GRAZING MANAGEMENT PLAN

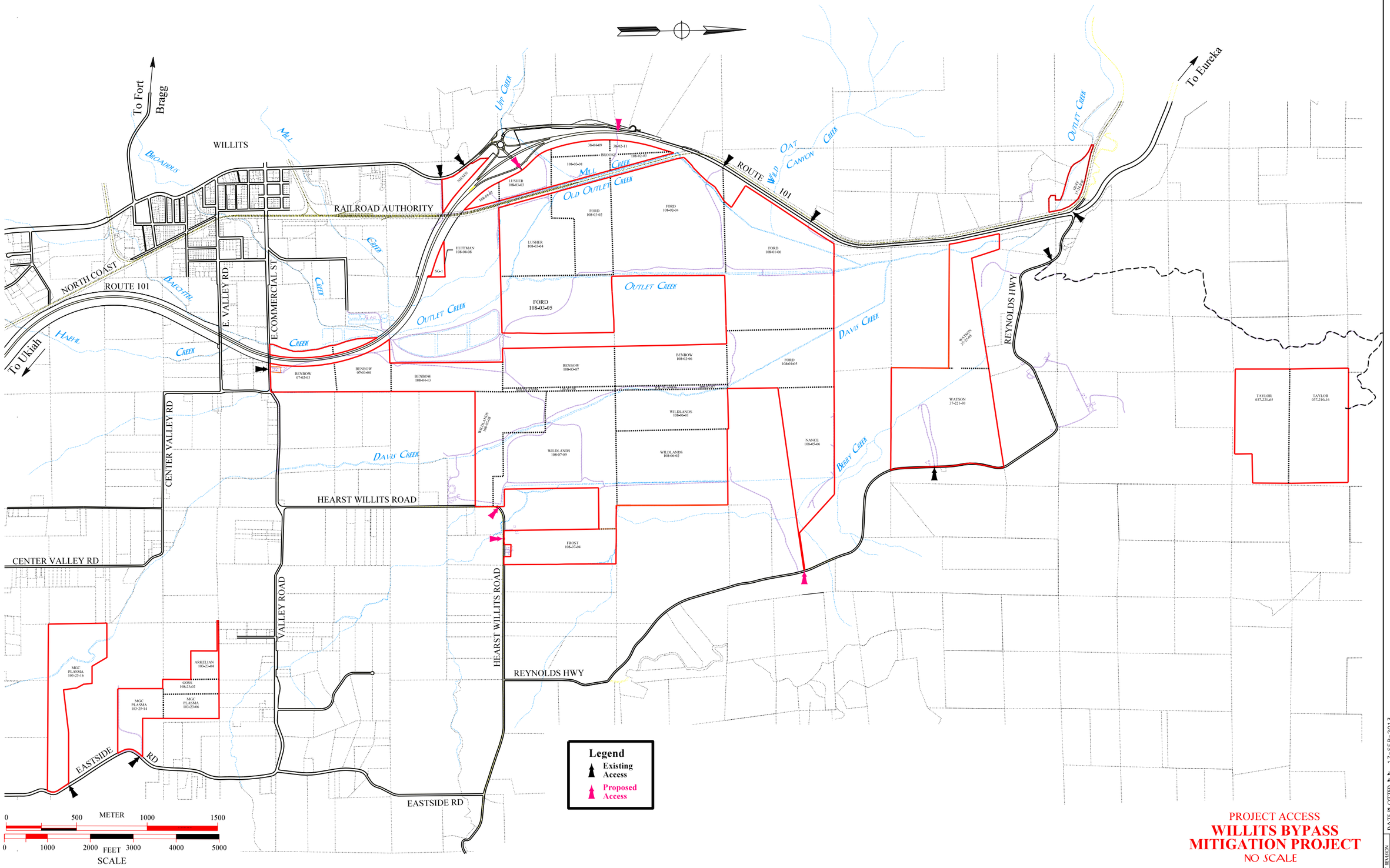
2013 BIRD NESTING ACTIVITY ALONG WILLITS BYPASS PROJECT ALIGNMENT

MENDOCINO COUNTY DETAIL - MENDOT STD. NO. A51A

MENDOCINO COUNTY DETAIL - MENDOT STD. NO. A51B

MENDOCINO COUNTY DETAIL - MENDOT STD. NO. A51C

ADDED PER ADDENDUM No. 4 DATED OCTOBER 11, 2013


To Fort Bragg
To Eureka
To Ukiah
WILLITS
RAILROAD AUTHORITY
NORTH COAST
ROUTE 101
ROUTE 101
E. VALLEY RD
E. COMMERCIAL ST
CENTER VALLEY RD
CENTER VALLEY RD
HEARST WILLITS ROAD
HEARST WILLITS ROAD
VALLEY ROAD
REYNOLDS HWY
REYNOLDS HWY
EASTSIDE RD
EASTSIDE RD
Broaddus
Mill
Up Creek
Mill Creek
Old Outlet Creek
Oat Canyon Creek
Outlet Creek
Davis Creek
Berry Creek
Haehl Creek
Baechtel Creek
Legend
Existing Access
Proposed Access
0 500 METER 1000 1500
0 1000 2000 FEET 3000 4000 5000
SCALE
PROJECT ACCESS
WILLITS BYPASS
MITIGATION PROJECT
NO SCALE
DATE PLOTTED 17-SEP-2013
TIME PLOTTED 14:32
LAST REVISION
00-00-00

Appendix Q
Grazing Plan - Draft

Willits Bypass Project

Grazing Management Plan
Managing Grazing and Grazinglands

U.S. Highway 101

Mendocino County, near the City of Willits, California

PM 43.1-52.3

01-26200

March 2013

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

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List of Abbreviated Terms

ai/A	active ingredient per acre
APN	assessor parcel number
AUMs	animal unit months
BM	Baker's meadowfoam
Caltrans	California Department of Transportation
CNPS	California Native Plant Society
EMU	East Management Unit
FHWA	Federal Highway Administration
GMP	grazing management plan
MMPs	mitigation and monitoring proposals
MMU	Middle Management Unit
NCSG	North Coast semaphore grass
NMU	North Management Unit
NRCS	Natural Resource Conservation Service
OWMU	Oak Woodland Management Unit
project	Willits Bypass Project
RDM	Residual dry matter
NCSGMU	North Coast Semaphore Grass Management Unit
SMU	South Management Unit
US 101	U.S. Highway 101
WMU	West Management Unit

Chapter 1 Introduction

The California Department of Transportation (Caltrans), in conjunction with the Federal Highway Administration (FHWA), is proposing to construct the Willits Bypass Project (project), a new section of U.S. Highway 101 (US 101) that will bypass the city of Willits in Mendocino County (Figure 1-1). The project will result in unavoidable impacts on wetlands and waters of the State (i.e., aquatic resources), riparian, oak woodland, and special-status plant species habitat in and adjacent to the project's right-of-way.

Parcels located outside the bypass alignment footprint that are included in the project's compensatory mitigation package are referred to as *offsite mitigation parcels* (Figure 1-2). This grazing management plan (GMP) applies to the offsite mitigation parcels and supports an adaptive management approach to land management.

This introductory chapter identifies the purpose and goals of the GMP. The balance of the document is organized as shown below.

- Chapter 2, "Existing Conditions of the Offsite Mitigation Parcels," describes existing natural resources (soils, hydrology, vegetation and habitats), the existing grazing infrastructure, and management practices on the offsite mitigation parcels.
- Chapter 3, "Standard Grazing Management Practices," describes standard grazing management practices.
- Chapter 4, "Invasive Species Management Practices," describes management practices for targeted invasive species that occur on one or more of the offsite mitigation parcels.
- Chapter 5, "Mitigation Unit Objectives and Grazing Practices," describes the recommended grazing management practices for the grazing mitigation units, including pasture size and location size and recommended grazing infrastructure.
- Chapter 6, "References," lists the references and source materials used in preparation of the GMP.

Several appendices are included as part of the GMP.

- Appendix A, Glossary of Terms.
- Appendix B, Recommendations for Grazing to Maintain and Increase Baker's Meadowfoam.

- Appendix C, Recommendations for Grazing to Maintain and Increase North Coast Semaphore Grass.
- Appendix D, Willits Bypass—Websites that Support the Grazing Management Plan.
- Appendix E, Fence Guidelines.
- Appendix F, Riparian Corridor Grazing Guidelines.

Caltrans developed two mitigation and monitoring proposals (MMPs) for the project to offset the unavoidable project impacts on biological resources. The compensatory mitigation to offset project impacts on biological resources includes State special-status plant species establishment and rehabilitation; wetland establishment, reestablishment, rehabilitation and preservation; waters of the State rehabilitation and preservation; riparian establishment and rehabilitation; and oak woodland preservation. Compensatory mitigation will increase the functions of wetlands and waters of the State and will be self-sustaining in perpetuity.

As described in the MMPs, two wetland rehabilitation approaches will be implemented on the mitigation parcels—one that includes grazing and one that will prohibit grazing. This grazing plan applies only to those pastures on which grazing will continue.

One MMP was developed for the State of California resource agencies (North Coast Regional Water Quality Control Board [NCRWQCB] and California Department of Fish and Game [CDFG]). As part of the mitigation project, these agencies require that grazing continue as a management tool to offset unavoidable impacts on wetlands and special-status plant species. Special-status plant species affected by the project are Baker's meadowfoam (BM) (*Limnanthes bakeri*) and North Coast semaphore grass (NCSG) (*Pleuropogon hooverianus*). The second MMP was developed for U.S. Army Corps of Engineers (USACE) as mitigation for federally protected wetlands.

Grazing will continue to be used as a wetland and special-status plant species management tool for wetland mitigation under the State MMP (California Department of Transportation 2013). Grazing will be prohibited on federal wetland mitigation lands under the USACE MMP (California Department of Transportation 2012).

The vision of the State MMP mitigation strategy is to establish, reestablish, rehabilitate, and preserve a mosaic of high-functioning habitats in perpetuity, thus increasing the ecological value of Little Lake Valley and improving water quality in the Eel River basin. Grazing management to enhance wetlands and NCSG and BM habitat are some of the mitigation measures that will be

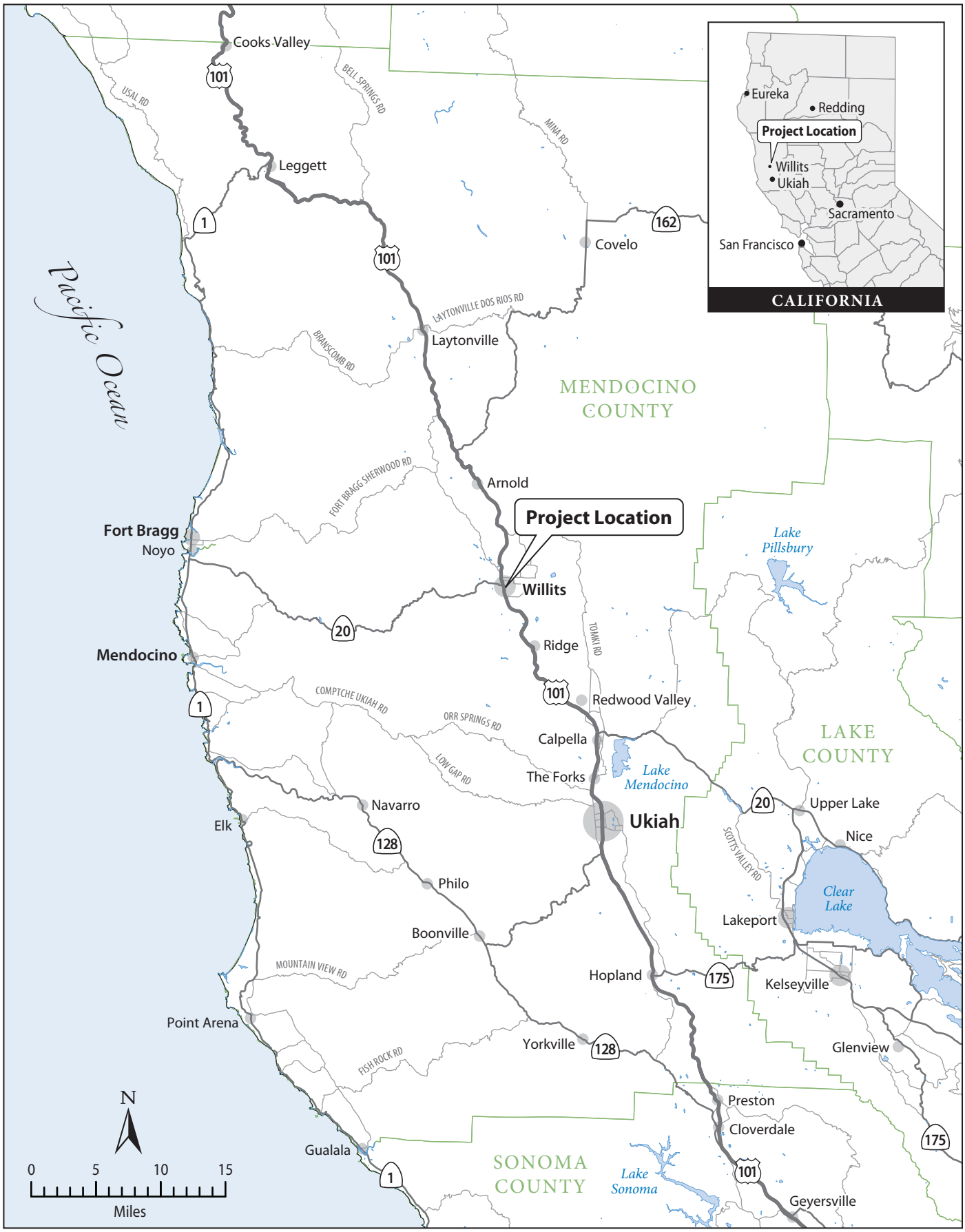

Figure 1-1
Regional Location

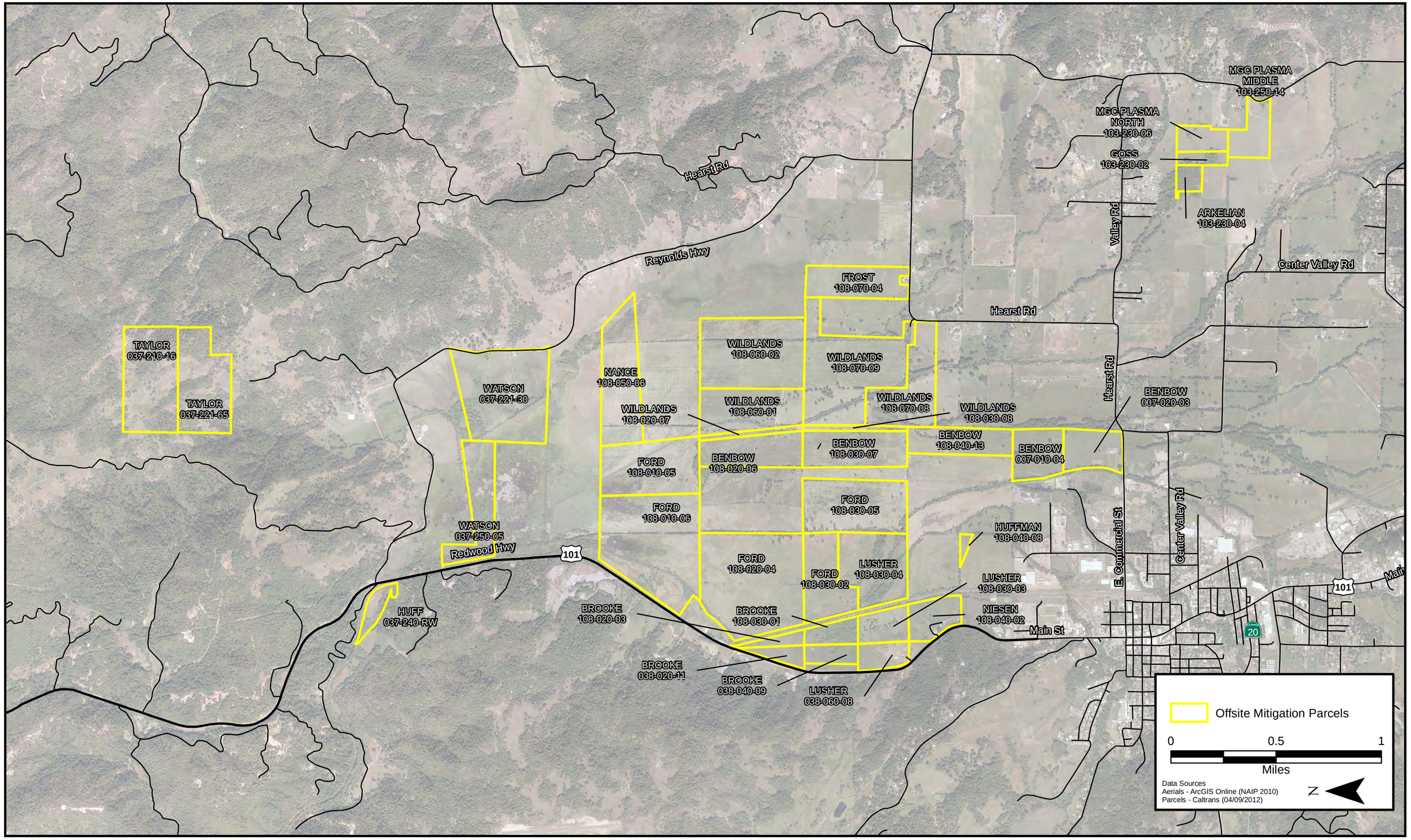

Figure 1-2
Location offsite Mitigation Parcels

implemented under the State MMP. This GMP is incorporated into the State MMP as an appendix.

1.1 Purpose of the Grazing Management Plan

The purpose of this GMP is to provide a grazing prescription and invasive species management alternatives for each offsite mitigation parcel. The GMP includes a prescription that is expected to promote the establishment and maintenance of wetland and riparian plant communities and associated plant species that will enhance wetlands and support and potentially increase the extent of currently occurring NCSG and BM populations.

Grazing management will be either retained or discontinued on all or portions of the parcels, depending on the designated mitigation and land management actions (Figure 1-3). Grazing management will be used to maintain and enhance habitat for two special-status species as well as enhance the existing wetland vegetation communities. Grazing will be used to improve areas that provide known occupied habitat and potential habitat for the purpose of maintaining and improving NCSG and BM habitat.

Additionally, as required by the USACE MMP (California Department of Transportation 2012), several parcels or subparcels will not be grazed to allow successional wetland plant community development or active wetland rehabilitation actions. Livestock will be excluded from all creek channels and riparian corridors except at designated channel crossings.

Appendix A is a glossary of grazing-related terms discussed in this GMP. The first occurrence of each of the terms in the glossary is presented in bold italics to facilitate review of this report.

1.2 Goals, Objectives, and Performance Standards

One goal of the GMP is to ensure that waters of the State (i.e., wet meadow, forested wetland, mixed marsh, streams) and riparian habitats on the parcels where grazing occurs are rehabilitated and provide increased habitat values to Little Lake Valley in perpetuity. Another goal of the GMP is to ensure that sensitive biological resources, including special-status plants, are managed such that these resources are maintained or improved.

Parcel-specific objectives were adapted from the goals and objectives in the following sources.

- Water quality goals and objectives for the GMP in the Monitoring and Reporting Program (No. R1-2010-0066, pg. 14) issued by the NCRWQCB (North Coast Regional Water Quality Control Board 2007).
- Draft State MMP, dated June 2012 (California Department of Transportation 2013).

The goals and objectives will be applied to each parcel as appropriate. Goals and objectives for grazing management include those following.

- Goal A: Maintain and improve the structure and function of seasonal wetland meadows, oak woodlands, and riparian habitats.
    - Objective 1: For wetlands, maintain or improve native seasonal wetland meadow species composition.
    - Objective 2: Maintain or improve native oak woodland species composition.
    - Objective 3: Maintain or increase native riparian vegetation.
- Goal B: Maintain and expand populations of special-status plants.
    - Objective 1: Maintain or expand populations of NCSG.
    - Objective 2: Maintain or increase populations of BM.
- Goal C: Reduce target invasive plant species.
    - Objective 1: Control medusahead (*Taeniatherum caput-medusae*).
    - Objective 2: Control yellow starthistle (*Centaurea solstitialis*).
    - Objective 3: Control Himalayan blackberry (*Rubus armeniacus*).
    - Objective 4: Control reed canarygrass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*).
- Goal D: Maintain grazed parcels in a productive, vigorous and competitive condition.
    - Objective 1: Residual dry matter (RDM) on seasonal wetland meadows no lower than 1,500 pounds per acre (lb/acre) at the end of the grazing season.
    - Objective 2: RDM no lower than 1,000 lb/acre on oak woodlands on or about October 1.

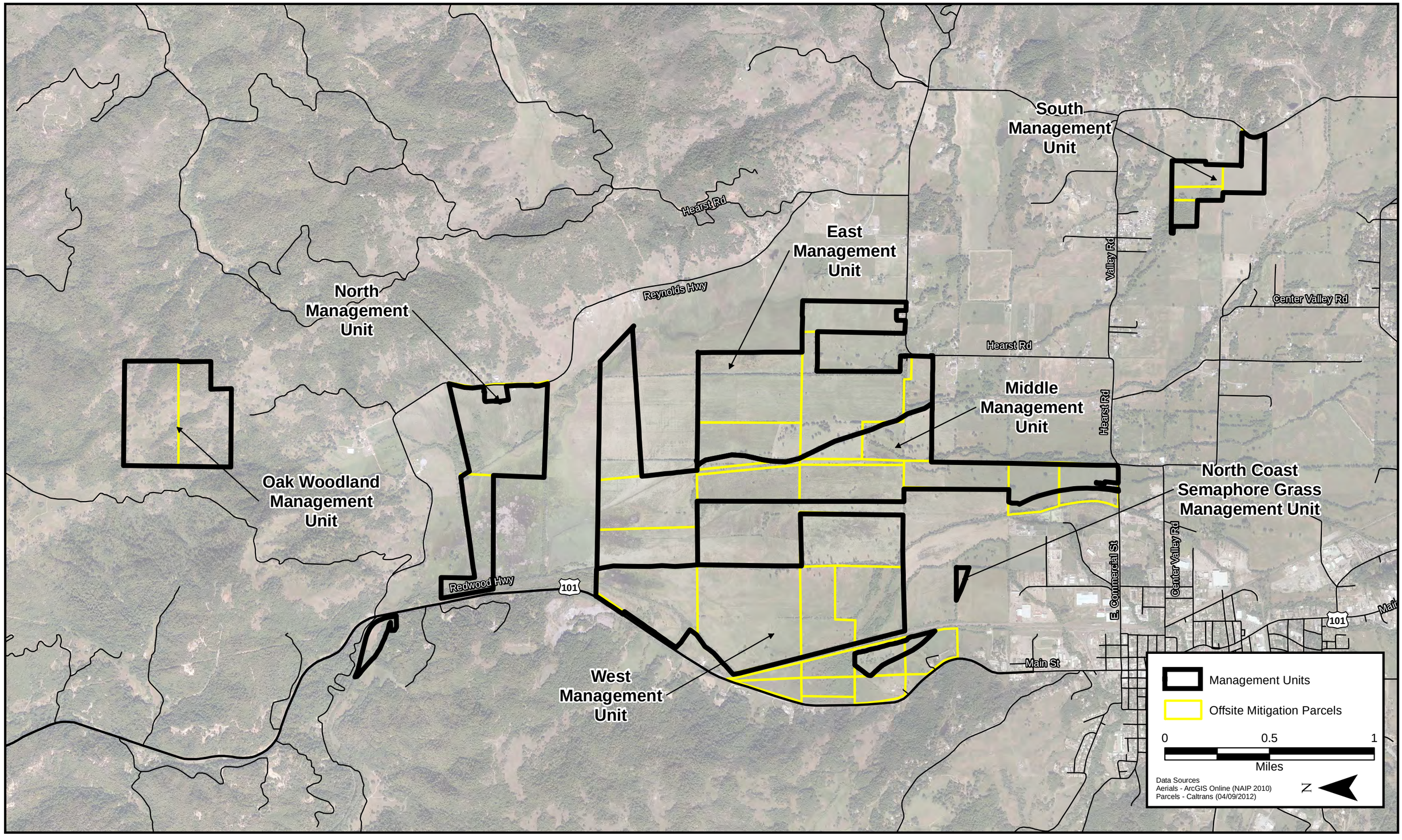

Figure 1-3
Location of Grazing Management Units and Offsite Mitigation Parcels

The performance standards for wetland, riparian, and special-status plant mitigation are presented in Chapter 9 of the State MMP.

To further assist in reaching the goals, the Land Manager is expected to coordinate and make a one-time grazing educational meeting with each lessee. The purpose of the meeting is to explain the goals of the mitigation project and how grazing is used to help reach those goals

Chapter 2 Existing Conditions of the Offsite Mitigation Parcels

The State MMP describes the soils, hydrology, vegetation, and habitats of Little Lake Valley. This section describes the existing conditions, productivity, and grazing infrastructure for each of the offsite mitigation parcels.

2.1 Defining Rangeland and Pasture

The offsite mitigation parcels are composed primarily of annual plant–dominated rangeland sites and perennial plant–dominated wet meadows that are managed as pasture and sometimes irrigated. These meadows will be referred to as *wet meadows* throughout the report. Table 2-1 identifies the vegetation types, including rangeland (grassland or oak woodland), riparian forest, and wet meadows occurring on the offsite mitigation parcels.

Rangeland is dominated by vegetation that is predominantly grasses, grass-like plants, forbs, or shrubs. Rangelands may include natural grasslands, savannas, shrublands, most deserts, tundra, and alpine communities. Rangeland is infrequently seeded or fertilized and not irrigated. Upland sites in Little Lake Valley are dominated by annual rangelands that tend to be less productive and have a shorter growing season and a lower carrying capacity than the wet meadows. These upland sites are dominated by annual plants that germinate and begin to grow with the first fall rains, grow slowly in winter, grow rapidly in the spring, and then dry in late spring (George et al. 2001).

The wet meadows occur mainly on poorly drained Fluvaquents, Haplaquents, and Gielow Series soils. Wet meadows are dominated by introduced cool-season plants such as tall fescue (*Festuca arundinacea*), orchard grass (*Dactylis glomerata*), perennial ryegrass (*Lolium perenne*), strawberry clover (*Trifolium fragiferum*), white clover (T. *repens*), and trefoil (*Lotus* spp.) that were seeded for improved forage quantity and quality. Creeping bentgrass (*Agrostis stolonifera*), reed canarygrass (*Phalaris arundinacea*), and Harding grass (*Phalaris tuberosa*) also occur on these soils and may have invaded or may have been seeded in the past. These meadows are most productive in April through June, with production slowing as the summer progresses and soil moisture becomes depleted. In some cases the wet meadows are irrigated to extend the productive season.

Table 2-1. Production Estimates, Vegetation Types, Pasture Numbers, and Acreage for Mitigation Areas to be grazed, by Management Unit

Management Unit	Parcel	APN	Area (Acres)	Pasture Number	Vegetation Type	Production Estimates 2011 (lb/ac)	
						June	Total
West Management Unit	Ford	108-010-06	65.31	W-1, W-2, W-3	WM, RG	6,900	8,625
	Ford	108-020-04	89.83	W-4, W-5, W-6	WM	8,000	10,000
	Ford	108-030-02	8.88	W-6	WM	7,500	9,375
	Lusher	038-060-08	0	N/A	WM	6,500	8,125
	Lusher	108-030-03	12.82	W-9	WM	6,500	8,125
	Lusher	108-030-04	20.69	W-7, W-8	WM	6,500	8,125
	Niesen	108-040-02	4.06	W-9	WM	7,000	8,750
	Total		**201.59**				
Middle Management Unit	Ford	108-010-06	45.04	M-1	WM, RG	6,900	8,625
	Ford	108-010-05	64.49	M-1, M-2, M-3	WM	8,100	10,125
	Nance	108-050-06	68.18	M-4, M-5, M-6, M-7	WM	7,100	8,875
	Benbow	007-010-04	0	N/A	WM	7,500	9,375
	Benbow	007-020-03	0	N/A	WM	8,000	10,000
	Benbow	108-020-06	41.74	M-8, M-9	WM	8,000	10,000
	Benbow	108-030-07	35.09	M-9, M-10	WM	7,500	9,375
	Benbow	108-040-13	0	N/A	WM	7,500	9,375
	Wildlands	108-070-08	25.24	M-11, M-12	WM	8,000	10,000
	Wildlands	108-030-08	4.84	M-11			
	Wildlands	108-020-07	1.28	N/A	WM	7,000	8,750
	Wildlands	108-060-01	0.12	M-8	WM	8,000	10,000
	Wildlands	108-070-09	4.27	M-11	WM	8,000	10,000
	Total						
East Management Unit	Frost	108-070-04	43.73	E-8, E-9	WM	7,500	9,375
	Wildlands	108-060-01	38.63	E1	WM	6,000	7,500
	Wildlands	108-060-02	92.55	E-2, E-3, E-4, E-5	WM	8,900	11,125
	Wildlands	108-070-08	14.89	E7	WM	8,000	10,000
	Wildlands	108-070-09	77.16	E-3, E-6	WM	8,000	10,000
	Total		**266.96**				
South Management Unit	Arkelian	103-230-04	9.95	S-1	RF, WM	5,700	7,125
	Goss	103-230-02	9.34	S-2	WM	5,700	7,125
	MGC Plasma North	103-230-06	10.99	S-2, S-3	WM	4,602	5,753
	MGC Plasma Middle	103-250-14	22.76	S-2, S-3, S-4	RG	3,649	3,649
	Total		**53.04**				
North Management Unit	Watson	037-221-30	59.28	N-1, N-2	RG	3,100	6,450
					WM	7,000	8,500
	Total		**59.28**				
North Coast Semaphore Grass Management	Huffman	108-040-08	3.27	SG-1	WM	4,600	7,125
	Total		**3.27**				
Oak Woodland Management Unit				OW-1	RO	3,000	3,300
	Taylor	037-210-16	83.20				
	Taylor	037-210-65	72.92				
	Total		**156.12**				

WM = wet meadow.
RG = Rangeland (grassland).
RO = Rangeland (oak woodland).
RF = Riparian forest.

Pasture is a unit of land that grows vegetation suitable for grazing and is fenced so that it can be grazed by livestock. In this report, *pasture* refers to a unit of rangeland or wet meadow that is fenced so that it can be grazed.

2.2 Parcel Productivity

2.2.1 Rangeland

Because of shallow soils and steep topography, rangeland productivity and growing season length are less than on wet meadows, where soils are deep and topography is relatively flat. Productivity on rangeland sites is often available in range or ecological site descriptions from U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS).

Recognizing that rangeland production varies greatly between years because of differing weather conditions, NRCS usually provides estimates for poor, normal, and good years. While production estimates for not all of the rangeland soils could be obtained from NRCS, there was a range of 1,500 lb/acre to 3,000 lb/acre for sites that identified soils on the mitigation parcels (Table 2-2). Field surveys performed during summer 2011 for this GMP estimated range forage production to be about 3,000 to 4,500 lb/acre for the 2010–11 growing season (Table 2-1).

Table 2-2. Productivity of Rangeland (Upland) Soils (USDA NRCS)

Management Unit	Area (Acres)	Mapping Unit			Productivity (lb/acre)		
		Number	Area (Acres)	Soil Complex	Good	Normal	Poor
WMU	581.89	NA	NA	NA	NA	NA	NA
MMU	447.76	115	143.51	Cole Clay Loam, 0 to 2% slopes	3,000	2,500	1,500
		105	4.19	Bearwallow, Hellman, Witherell, 30 to 50% slope	2,400	1,800	1,200
		203	1.40	Talmage Gravelly Sandy Loam, 0 to 2% slopes	2,200	1,500	800
EMU	346.37	115	56	Cole Clay Loam, 0 to 2% slopes	3,000	2,500	1,500
SMU	65.3	115	31.40	Cole Clay Loam, 0 to 2% slopes	3,000	2,500	1,500
NMU	131.5	115	37.90	Cole Clay Loam, 0 to 2% slopes	3,000	2,500	1,500
OWMU	149.70	111	7.81	Casabonne, Wohly, Pardaloe, 50 to 75 % slope	-	-	-
		172	30.31	Pardaloe, Kekawaka, Casabonne, 50 to 75% slopes	-	-	-
		211	38.91	Witherell, Hopland Squawrock (50 to 75% slope	2,500	2,000	1,300
		233	67.41	Yorkville, Squawrock, Witherell, 30 to 50%, slopes	2700	2100	1300
NCSGMU	2.97	105	4.19	NA	NA	NA	NA

NA = not applicable.
WMU = West Management Unit.
MMU = Middle Management Unit.
EMU = East Management Unit.
SMU = South Management Unit.
NMU = North Management Unit.
OWMU = Oak Woodland Management Unit.
NCSGMU = Semaphore Grass Management Unit.

2.2.2 Seasonal Wet Meadows

Forage production on the wet meadows from the beginning of the growing season to flowering in June 2012 was estimated before grazing using the comparative yield, double sampling method (Haydock and Shaw 1975; George et al. 2006). At that point in the growing season no parcels had been irrigated. Because the productivity was estimated prior to the application of seasonal irrigation, production estimates, which help determine the stocking rates, already reflect a situation of no supplemental water. These production estimates assumed that the pastures, including Ford parcels 108-020-04, 108-030-02, and 108-030-05 that routinely received supplemental water to improve late season forage, are not irrigated. Therefore, the production estimates or stocking rates presented in this grazing plan are appropriate for those parcels that have been historically irrigated but will not continue to be irrigated under the new grazing plan. Once grazing begins, it is difficult to accurately estimate regrowth following grazing. However, based on the irrigated pasture production curve of George and coauthors (1992), it is estimated that the additional forage produced in July and August before soil moisture was exhausted was about 20 to 30% of the total annual production. Table 2-1 reports that June 2012 production on wet meadows ranged from about 5,700 lb/acre to 8,900 lb/acre.

2.3 Grazing Infrastructure

Grazing infrastructure includes site features that support grazing management. Grazing infrastructure on the offsite mitigation parcels is fences, gates, and stockwater facilities. The location and condition of these features were inventoried and geo-positioned in June and August 2011 (Figures 2-1 through 2-7). There is occasional disagreement between existing fence lines and assessor parcel number (APN) boundaries. Specific infrastructure needs are recommended for each management unit in Chapter 5.

Repair or upgrading of perimeter and cross-fencing and gates on many parcels is needed. In several parcels removal of old fence posts and down wire is needed to reduce hazards for personnel, livestock, and wildlife. Some fences are overgrown by riparian vegetation, especially Himalayan blackberry. Along many riparian corridors, dense tree and shrub communities cannot be penetrated by livestock and are not fenced. Himalayan blackberry is frequently part of the vegetation structure that prevents livestock access to the stream channel.

Caltrans proposes to replace all existing perimeter fences, and cross-fences will be installed in accordance with the recommendations of this GMP. New fences also will be installed along stream corridors and to protect establishment and rehabilitation action areas, as required by the

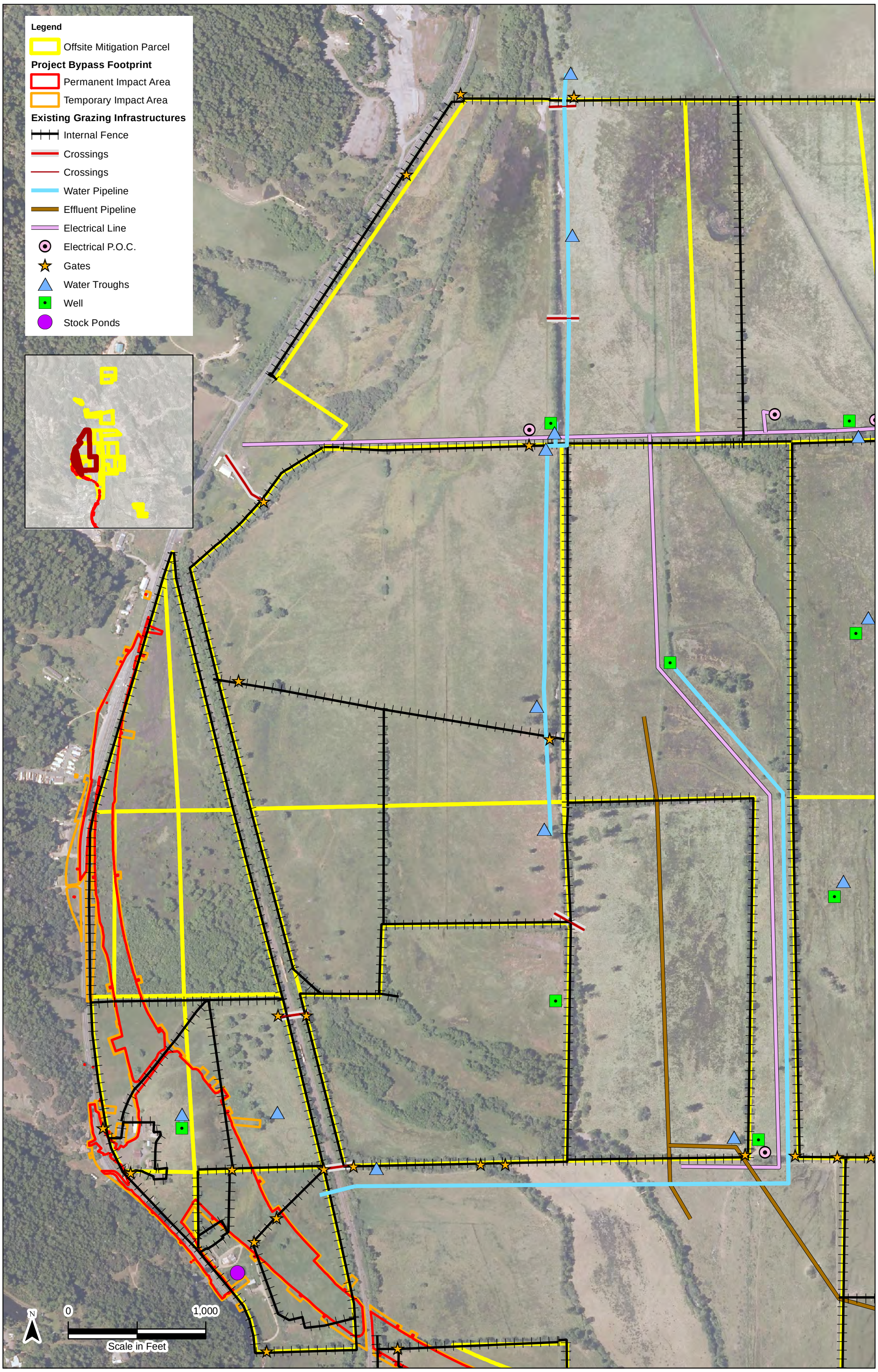

Figure 2-1
Location of Existing Grazing Infrastructure in the West Management Unit

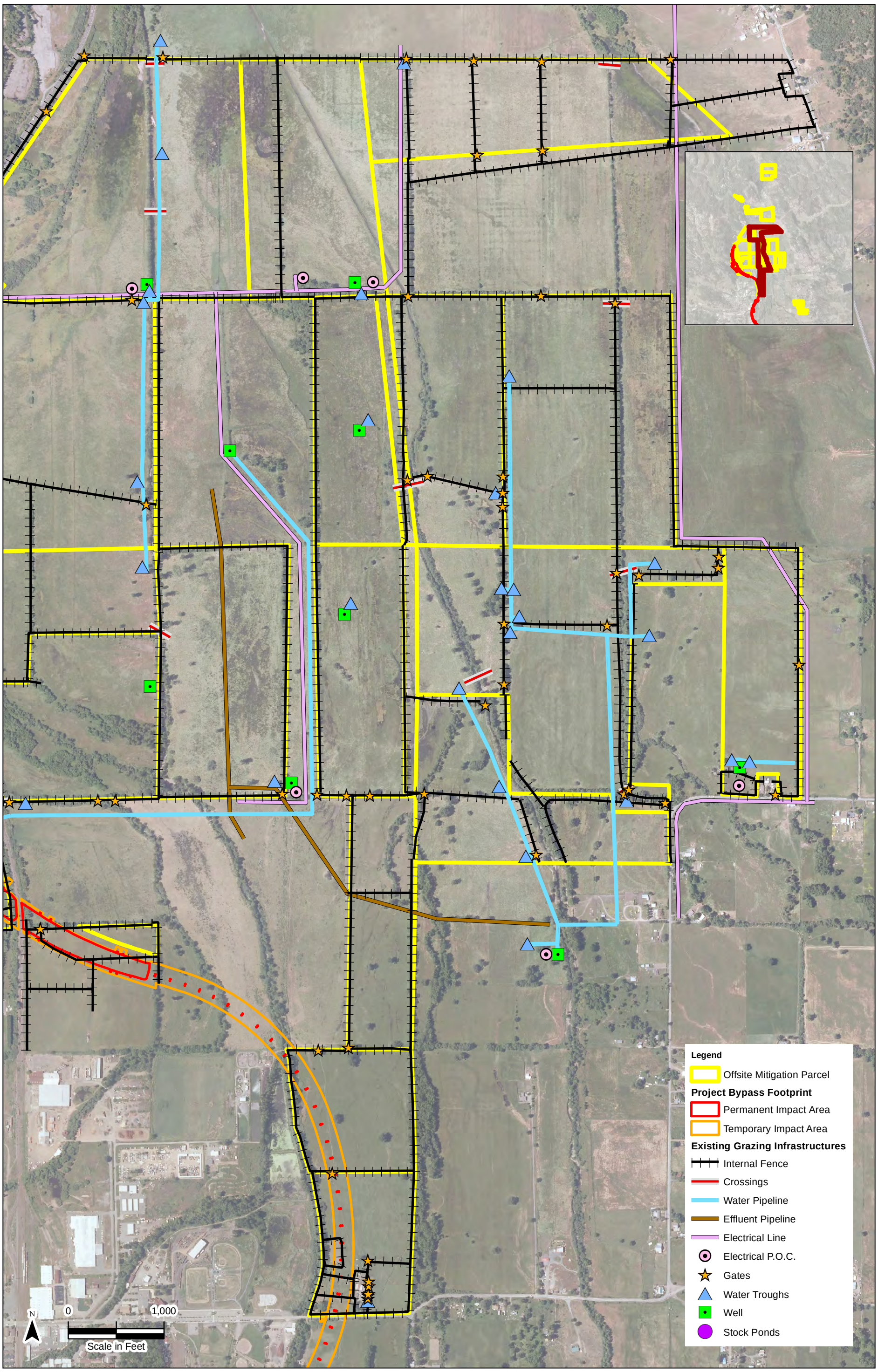

Figure 2-2
Location of Existing Grazing Infrastructure in the Middle Management Unit

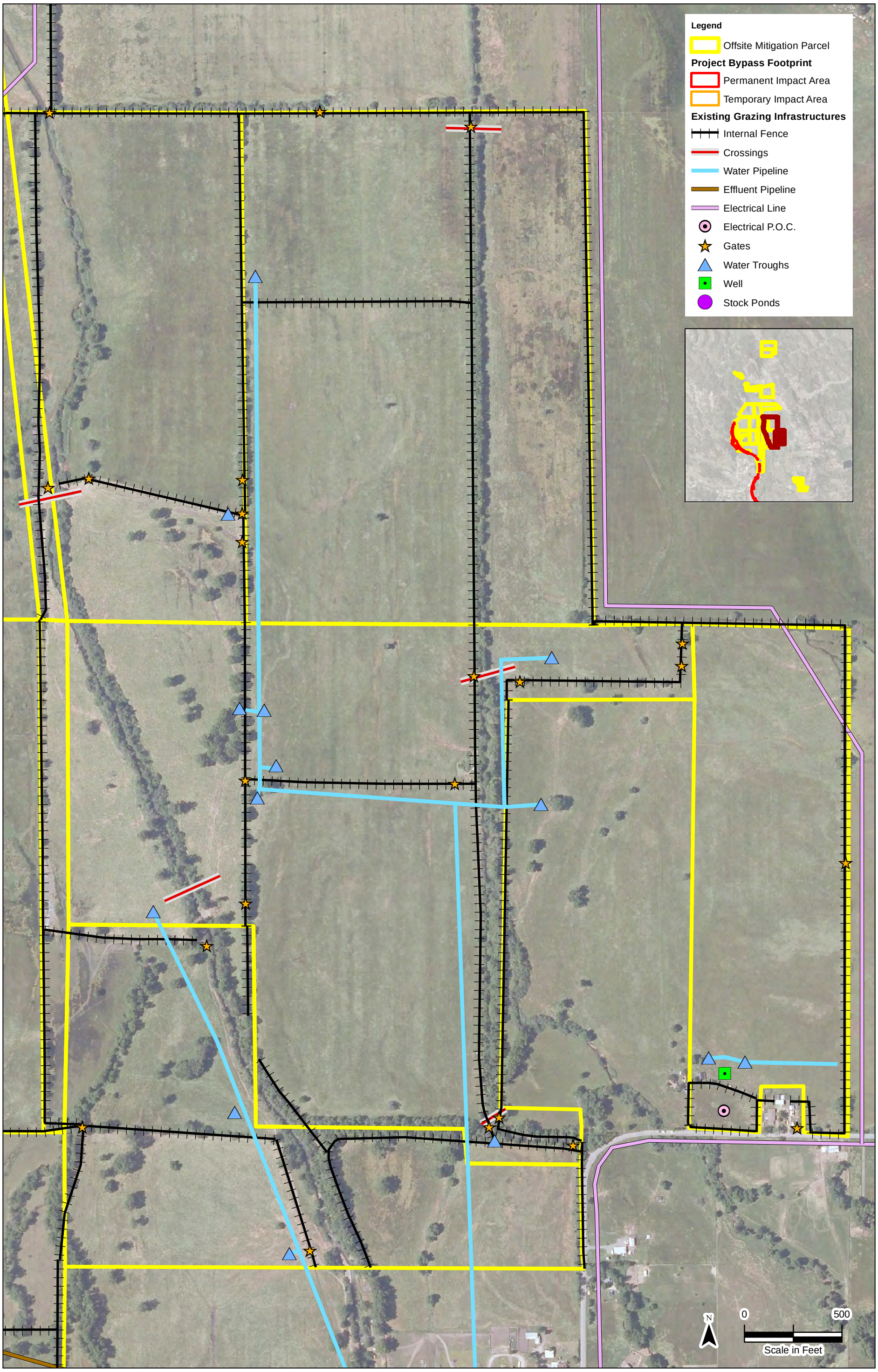

Figure 2-3
Location of Existing Grazing Infrastructure in the East Management Unit

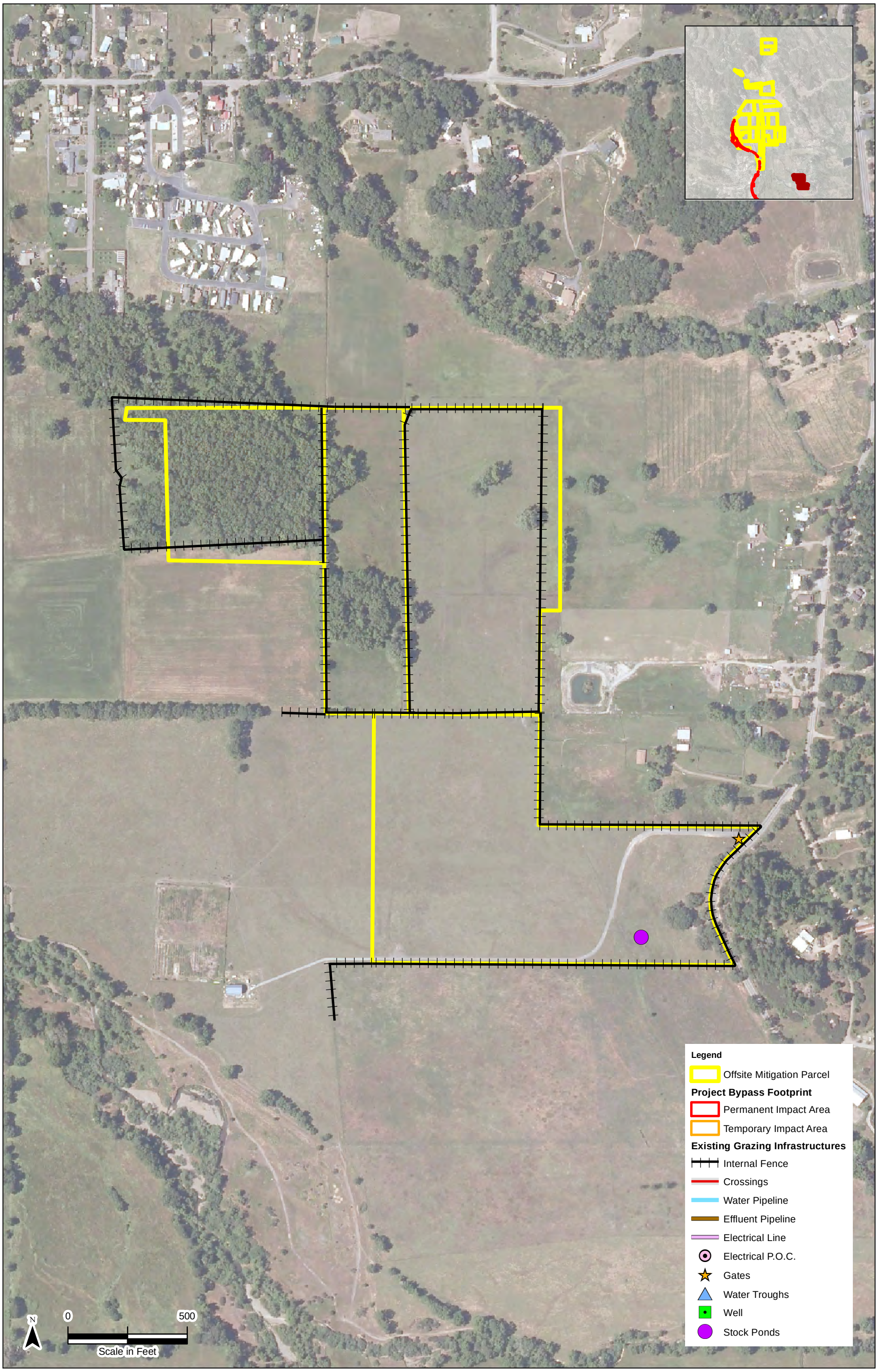

Figure 2-4
Location of Existing Grazing Infrastructure in the South Management Unit

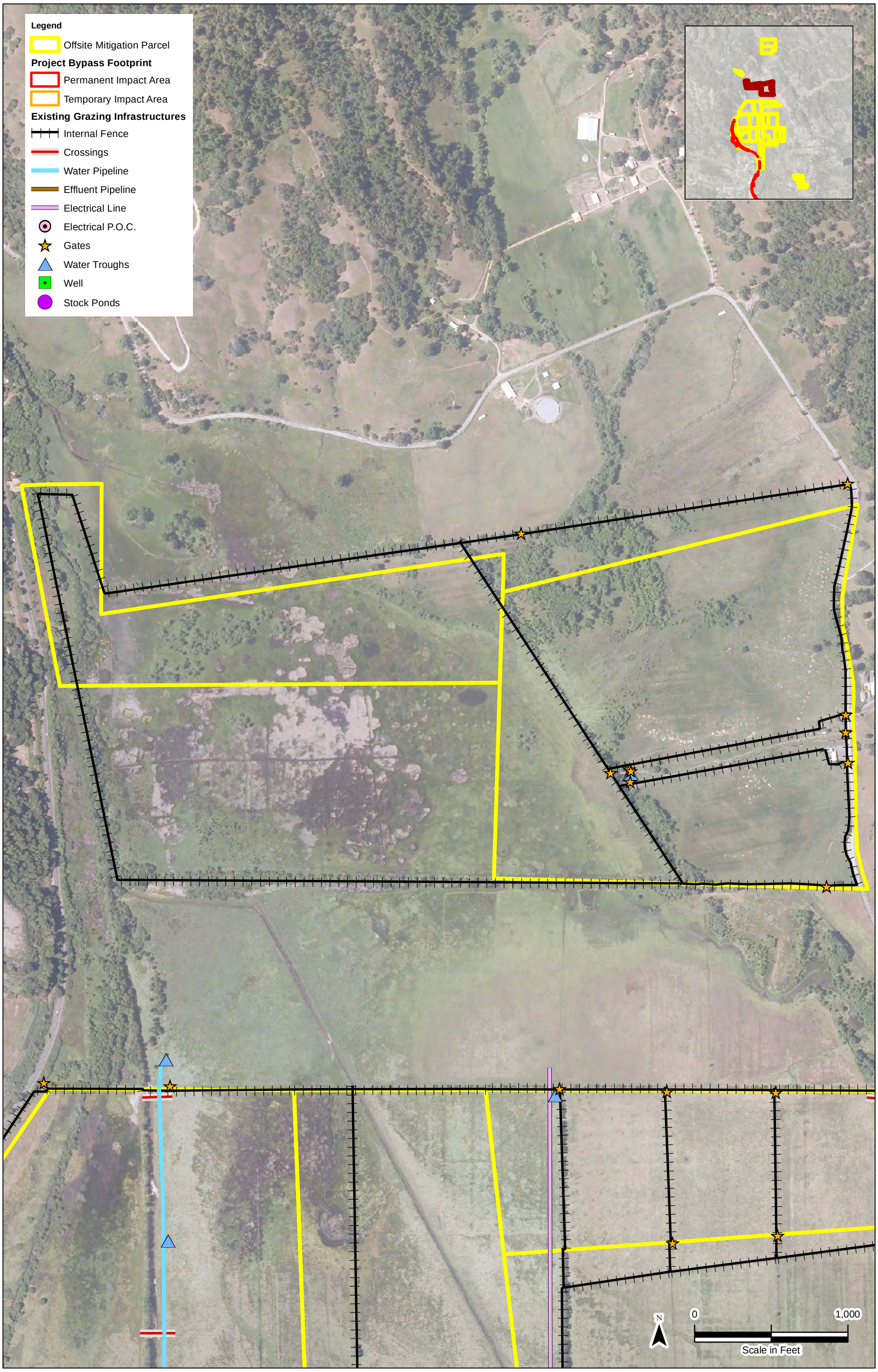

Figure 2-5
Location of Existing Grazing Infrastructure in the North Management Unit

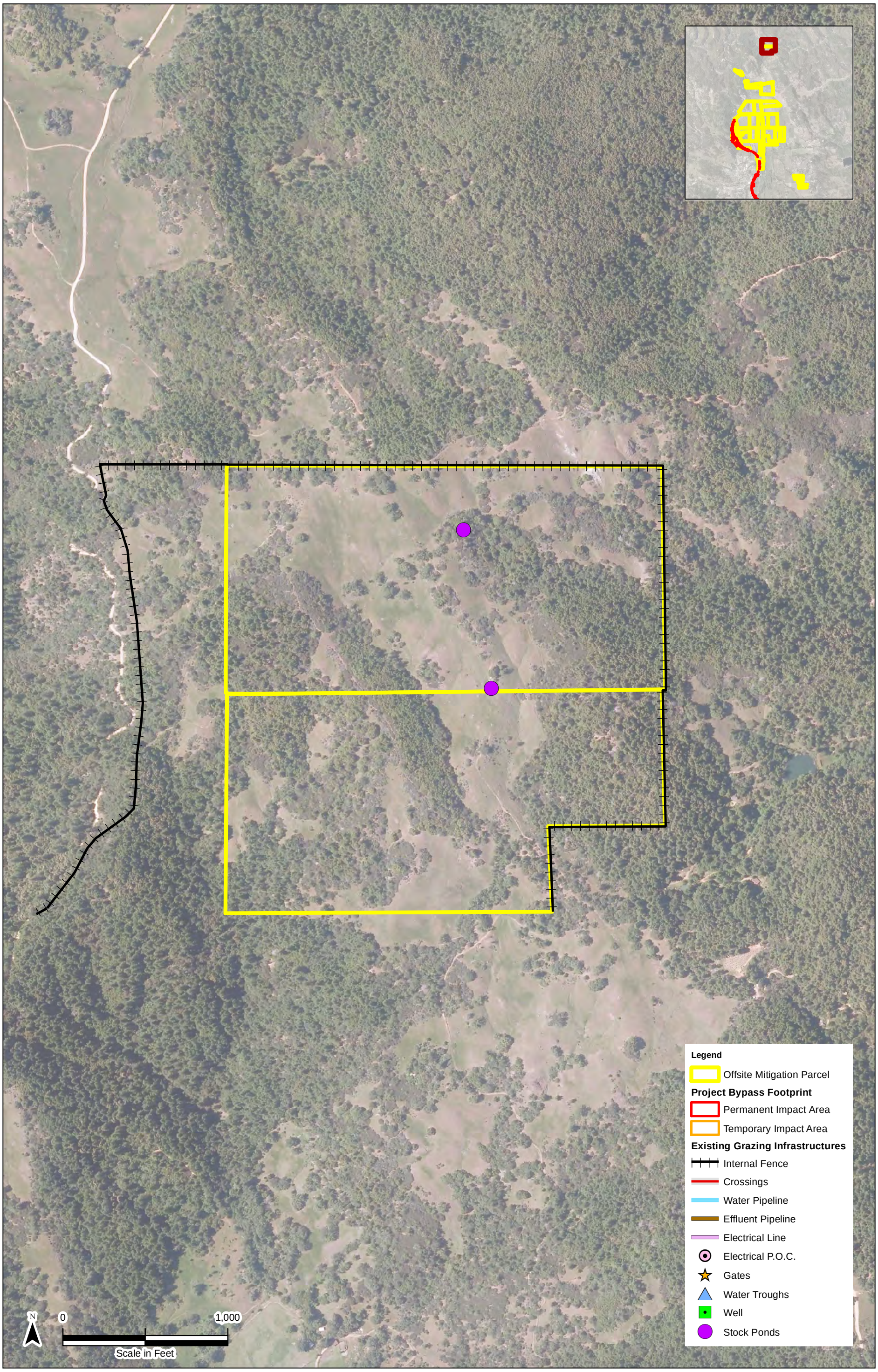

Figure 2-6
Location of Existing Grazing Infrastructure in the Oak Woodland Management Unit

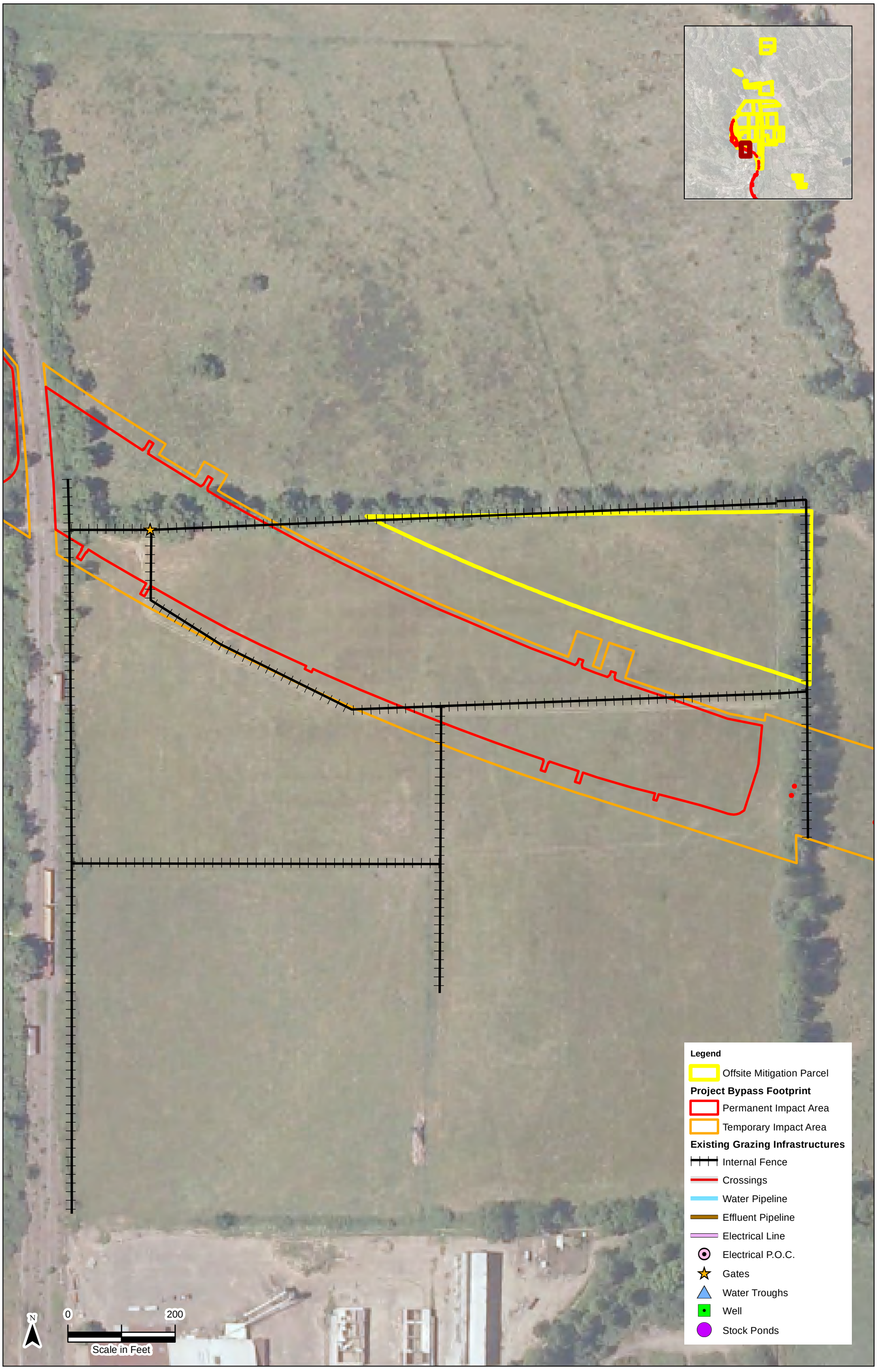

Figure 2-7
Location of Existing Grazing Infrastructure
in the North Coast Semaphore Grass Management Unit

USACE and State MMP. New fences will be installed around wetland establishment areas as required by the USACE MMP.

New stockwater facilities will be required for each pasture that lacks them. New stockwater facilities also will be needed in subunits where adjacent creeks currently serve as the stockwater source. An 8-foot-diameter water trough can supply water to 200 cows. During hot weather mature beef cows can consume 20 to 30 gallons of water daily. Cows have a pecking order for who drinks first. If an adequate supply of water is not provided, cattle may panic and break fences to get to water. Therefore, it is recommended that adequate stockwater facilities be designed and installed to provide a reliable water source in each pasture.

It is recommended that the current grazing lessees be involved in the final decisions about where to place pasture infrastructure (internal fences, gates, water development, and stream crossings) because several of them have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs. Gates and stream crossings should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and typically is the best person to decide location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring. Recommendations for the general locations of fences, gates, water troughs, and crossings are identified in Chapter 5.

Chapter 3 Standard Grazing Management Practices

Grazing managers can influence or control the season, ***frequency, duration,*** and ***intensity*** of grazing. They also can choose the kind and class of animal and influence animal behavior and livestock distribution with the placement of pasture infrastructure. Using an ***adaptive management*** approach, grazing managers can apply grazing practices that maintain or improve seasonal wetland habitat, maintain or improve habitat for plant species of concern, target invasive species, reduce nonpoint-source pollution, and protect riparian corridors.

The grazing management practices described in this chapter are among the best management practices approved by the State Water Resources Control Board in the 1995 California Rangeland Water Quality Management Plan at:

- http://www.waterboards.ca.gov/publications_forms/publications/general/docs/ca_rangeland_wqmgmt_plan_july1995.pdf on pgs 54-58, and republished a
- http://californiarangeland.ucdavis.edu/Publications%20pdf/FS9.pdf.

The effectiveness of many of these practices has recently been reviewed by USDA (Briske et al. 2011 and George et al. 2011).

This section identifies and defines standard grazing management practices, including ***rotational grazing***, that potentially could be implemented on the offsite mitigation parcels and discusses how they can be applied to suppress nonnative vegetation so that native plant populations can be maintained or improved. A successful grazing management system needs to address environmental, economic, and social aspects of a grazing or ranching system. For the bypass project, the primary focus will be on achieving the wetland and special-status species mitigation goals and performance standards. If grazing operations under this GMP prove not to be profitable for the lessees, this issue will be addressed as part of the adaptive management process including review of alternative practices that can meet mitigation goals and performance standards within an adaptive process. Throughout this section, practices that support mitigation parcel objectives will be identified. Grazing management recommendations are provided in Chapter 5.

3.1 Season of Grazing

The typical ***season of grazing*** for most of the offsite mitigation parcels is late spring to fall with no grazing in the wet season. Only the North Management Unit (NMU) is grazed all year. Wet meadows generally are not grazed during the winter and early spring when productivity is low and soils are saturated as a result of rainfall and inundation and are subject to compaction. Thus, in most years and management units, the season of grazing for pastures that have these characteristics should be from May 1 to October 31. A late spring start date allows winter rains and floodplain inundation to subside and the parcels to begin to dry. A fall end date allows removal of livestock prior to the start of winter rains and periodic inundation. It is recommended that lessees have the flexibility to start grazing sooner or wait longer in response to prevailing soil moisture conditions.

Grazing during the May 1 to October 31 time period has several advantages. Spring grazing reduces taller nonnative vegetation that minimizes competition with shorter vegetation, including many native forbs (e.g., BM). This allows native forbs to bloom and complete their life cycles free of excessive shading. Spring and summer grazing also reduces vegetation levels during peak wildfire season. Grazing typically would be deferred until May; however, for the bypass project grazing in April may occur if it is determined to be beneficial to NCSG and BM (Section 3.6).

Seasonal grazing is the term for grazing restricted to a specific season or time of year. ***Season-long continuous grazing*** refers to continuous grazing for a season as opposed to season-long rotational grazing, which refers to a rotational grazing system during a particular season, as is recommended for many of the mitigation parcels.

3.2 Frequency and Duration of Grazing

Frequency of grazing and ***duration of grazing*** refer to how often a pasture (rangeland or wet meadow) is grazed, how long it is grazed, and how long it is rested between grazing periods. Differences between grazing methods ranging from continuous to very intensive rotational grazing are attributable to differences in frequency and duration of grazing. Rotation frequencies can vary from seasonal to daily, resulting in a continuum of grazing methods (Holechek 2004).

3.2.1 Continuous Grazing

The duration of grazing under continuous grazing is all year or all season in a single pasture. Historically in California and the U.S., pastures are often continuously grazed throughout the grazing season. In an adaptive grazing management program, continuous grazing can be used to

create a patchy herbaceous vegetation structure that may be desirable for some terrestrial and avian species. Under light stocking, animals are allowed maximum dietary selectivity throughout the year, which often creates a patchy herbaceous vegetation structure.

While continuous grazing can be practiced if proper stocking rates are followed, preferred plant species may be used more heavily while less preferred plant species are lightly used. If a native plant species is preferred it could be grazed too heavily and frequently could lead to reduced plant vigor and competitive ability. Preferences for semaphore grass by cattle, sheep, and goats are unknown. It has been observed that cattle do not graze BM (Hulse-Stephens pers. comm.), but sheep and goat preferences are not known.

3.2.2 Rotational Grazing

With most rotational grazing, only one pasture is grazed at a time while the other pastures rest. Resting grazed pastures allows native and nonnative herbaceous wet meadow vegetation to restore energy reserves, replace leaf area, rebuild vigor, deepen root systems, and lengthen maximum production. Rotational grazing can be practiced in a range of intensities from two pastures to more than 30. Intensive rotational grazing of pastures involves a higher level of management with greater pasture numbers (at least eight), shorter grazing periods, and longer rest periods. Generally, more intense management results in higher stock densities for shorter periods of time. Rotational grazing offers a number of potential advantages:

- More stable plant productivity.
- Potentially greater plant productivity.
- Decreased weed and erosion problems.
- More uniform distribution of grazing use, manure and urine.
- More uniform grazing reduces shading of NCSG by competing vegetation.
- Increased stock density and, therefore, trampling effects on BM patches.

Rotational grazing systems are set up so that livestock can move from one pasture to the next just by opening a gate and gently moving them to the next pasture. Sometimes they will move themselves. Rotational grazing is usually not effective in time or money if livestock must be moved long distances or hauling is required to rotate between pastures. Therefore, it is most efficient and effective if all pastures in a rotational grazing system are adjacent to each other.

Rotational grazing offers a means to reduce shading of NCSG and improve its competitive ability with the aggressive nonnative grasses in the wet meadows of Little Lake Valley. Because

NCSG often is mixed with aggressive nonnative pasture grasses, it is difficult to suppress the nonnatives without adversely affecting NCSG. In this mitigation project, the objective is to minimize shading of NCSG by nonnative grasses. Without grazing, the nonnatives, being taller and more aggressive, can shade and outcompete the native plants for sunlight. With continuous grazing, native plants (if they are preferred) may be preferentially grazed resulting in their suppression relative to the nonnatives. Rotational grazing, as applied in much of Little Lake Valley, tends to keep nonnatives from excessively shading natives, giving the natives a chance to maintain their presence and potentially expand. All the methods of grass expansion (tillering, rhizomes, and stolons) are stimulated by sunlight. Shading suppresses these physiological processes. There really is no other alternative for managing NCSG unless herbicides and cultivation are used to kill the nonnative grasses, but it is difficult to apply these practices without also destroying NCSG.

BM may be suppressed by taller vegetation that surrounds or invades BM patches. It has been learned that without grazing some desired native species, especially species with a decumbent (short-statured) growth habit (e.g., Baker's meadowfoam), will be suppressed by shading from taller ungrazed vegetation. According to the work of Marty (2005) and observed on the NMU, wetland species such as BM benefit from the removal of competing vegetation and are not harmed by the grazing treatment. It has been observed (Hulse-Stephens pers. comm.) that cattle do not graze BM. This may be because it is not palatable or because cattle preferences for taller vegetation that is easily ***prehended*** in large bites support their large daily forage intake requirements. Thus, both continuous and rotational grazing, at proper stocking rates guided by RDM targets, can be used to suppress taller vegetation that may compete with BM. In summary, targeted grazing for NCSG, BM, and other native wetland species can be accomplished with seasonal or year-round continuous grazing or rotational grazing if stocking rates are correct and RDM guides are followed.

3.2.3 Intensity of Grazing

Intensity of grazing refers to stock density, stocking rate, and carrying capacity. Determining the proper intensity of grazing (stocking rate) is a necessary step in developing any grazing management plan.

Stock density is the number of animals per unit area at any instant in time. Stocking rate is the number of specific kinds and ***classes of animals*** grazing or using a unit of land for a specified period of time. Stocking rate is commonly expressed as ***animal unit months*** (AUMs) per acre. One ***animal unit*** may be defined as one 1,000 lb cow. Animal unit equivalents for other kinds and classes of animals are shown in Table 3-1.

Table 3-1. Animal Unit Equivalents for Various Kinds and Classes of Livestock

Livestock Type	Animal Unit
Cattle	
Mature cows without a calf	1.0
Cow with a calf	1.2
Weaned calf to yearling	0.6
Steers and heifers (1-2 years)	1.0
Mature bulls	1.3
Sheep	
5 weaned lambs to yearlings	0.6
5 mature ewes with or without lambs	1.0
5 mature rams	1.3
Goats	
6 weaned kids to yearlings	0.6
6 does with or without kids	1.0
6 mature bucks	1.3
Horses and Mules	
Mature horse (1200 lb)	1 to 1.25
Mature mule	1 to 1.25
Wildlife	
6 deer	1.0
Antelope, mature	0.20
Bison, mature	1.00

Carrying capacity is the maximum stocking rate possible that is consistent with maintaining or improving vegetation or related resources. Carrying capacity is related to total production, but so many other factors influence carrying capacity that any estimate is fraught with uncertainty. In practice, proper stocking rates have been determined over many years of research, observation, and recordkeeping. Range managers often define a moderate stocking rate to be in the range of 40 to 60% utilization on a weight basis. In other words, “take half and leave half” as recommended by early range managers. Grazing above this range is defined as a heavy stocking rate, and grazing below this range is defined as light stocking. On California’s annual rangelands proper stocking is gauged by setting RDM guides to ensure that adequate ***litter*** is left behind to protect the soil and provide a good soil microclimate for germination. Excessive litter is often called thatch, which has gained common usage by restoration managers in California.

Varying stocking rate across the landscape can create a mosaic of vegetation structures and results in a diversity of ground habitats that can increase terrestrial wildlife diversity, especially of avian species. Knopf (1996) illustrated that grassland birds in the Great Plains respond to the

gradient of vegetation from bare ground through short and mixed grass to a mixed grass and shrub composition. Modern management practices that attempt to improve livestock distribution and reduce uneven grazing have reduced this landscape heterogeneity. Consequently some scientists believe that management practices that increase vegetation heterogeneity will be positive for grassland birds by increasing the variability in vegetation structure and composition (Derner et al. 2009).

3.2.4 Residual Dry Matter

RDM is the vegetative litter remaining in the fall at the end of the grazing season. RDM management has been used on California's annual plant–dominated foothill and valley rangelands for many decades. Only in the late 1970s did researchers with the University of California and USDA Forest Service begin to recommend target levels and measurement procedures for monitoring RDM. The University of California has published RDM guides based on precipitation, slope, and canopy cover (Bartolome et al. 2006). It is recommended that these guides be adapted to local conditions. The target RDM for rangelands in the offsite mitigation parcels is 800 to 1,200 lb/ac, reflecting the need for soil protection on steep slopes with high rainfall. Experience suggests that 1,200 lb/acre may be excessive on flat to gentle slopes; thus, 1,000 lb/acre is recommended in some of the management units. RDM management recommendations are presented in Chapter 5.

RDM targets for wet meadows have not been published. There are several considerations in developing RDM targets for wet meadows.

- Reduce shading of NCSG and BM by introduced perennial grasses and other competitors.
- Prevent vegetative litter buildup that may suppress BM.
- Maintain adequate cover to reduce the risk of erosion.
- Maintain adequate ground cover to provide filtration of pollutants from overland flow.

Shading from tall introduced pasture grasses is reduced as the height of these plants is reduced by grazing and trampling. Decreasing these grasses from 3–5 feet in height down to 1 foot in height during the grazing season will reduce the shading effect at the beginning of the next growing season.

Litter accumulates in a vertical and horizontal mosaic ranging from no litter (bare ground) to several inches. Vertical litter results when standing vegetation dries and dies. Horizontal litter results from trampling, wetting, or wind that lays vertical litter down to the ground surface. The

stubble of green perennial plants also varies in height depending on grazing pressure during the growing season. Buildup of litter (thatch) has been shown to suppress some annual plant species. Decumbent plants, such as many native and introduced annual forbs and some native grasses, are suppressed by litter because new seedlings of annual plants cannot grow through the thatch. BM falls in this category. Most perennial plants that regrow from stems and crowns near the soil surface are able to grow through accumulated litter. NCSG falls in this category. Reducing the vertical litter to less than 12 inches and the horizontal litter to less than 2 inches will reduce shading and suppression of seedling establishment, thus providing niches for decumbent plants to grow through the litter without affecting their vigor and competitive ability.

For BM patches, RDM of less than 1,500 lb/acre will reduce competition to BM while providing some trampling during grazing. For NCSG patches, RDM should not be less than 1,500 lb/acre to avoid close grazing that could destroy buds required by NCSG for regrowth following grazing. While a pasture-wide RDM greater than 1,500 lb/acre is achievable and well within current grazing levels, RDM below 1,500 lb/acre may require additional practices. For example, it may be necessary to confine livestock on BM patches using electric fence, or livestock may be attracted to BM patches using protein supplements and salt blocks. Dehydrated molasses supplements (Crystalyx) is a proven method of attracting livestock into an area to increase grazing and trampling (George et al. 2007). Alternatively, mowing the BM patches and adjacent areas to the desired level also could help maintain and increase the extent of BM patches but may require removal of the cut vegetation from the BM patches.

3.2.5 Stocking Rate

Determining ***stocking rate*** is a fundamental first step in grazing management planning. For the grazed portions of the GMP management unit, stocking rates must support mitigation and land management goals. For the bypass project, the primary consideration for determining stocking rate will be based on achieving the wetland and special-status species mitigation goals and performance standards. If grazing operations under this GMP prove not to be profitable for the lessees, this issue will be addressed as part of the adaptive management process. This section reviews stocking rates and confirms that they are compatible with stated NCSG and BM objectives and supported by recommended grazing management practices.

Relying on records provided by John Ford, it was determined that the stocking rate varies from about 4 AUMs/acre/year (5-month grazing season) to 6.5 AUMs/acre/year (7-month grazing season) for most of the wet meadows. As a frame of reference, good Sacramento Valley irrigated pasture supports about 10 to 12 AUMs/acre/year, and Sierra foothill oak woodlands support about 0.6 to 0.8 AUM/acre/year. Pastures that are harvested for hay usually provide 2 to 4 AUMs

after removing 2 tons of hay per acre. The RDM level for all of the offsite mitigation parcels, prior to grazing under the State MMP, presently exceeds 1,500 lb/acre.

Historically, the NMU has been grazed year-round with 35 to 40 mature cows and their calves (approximately 40 animal units). This equates to a stocking rate of about 3.3 AUMs/acre/year. Additionally about 60 to 80 tons of hay per year have been harvested from the eastern parcel that will not be grazed under the mitigation plan. Thus, the actual off-take for the Watson parcels is about 4.3 AUMs/acre/year, which is within the range reported for the Ford Ranch. It was also determined from Ford and Goss ranch records that hay production in the valley wet meadows they manage is about 1.5 to 2 tons/acre/year which is equivalent to about 3.75 to 5 AUMs/acre/year. All of these parcels are leaving at least 1,000 lb/acre of RDM on their upland soils (rangeland) and 1,500 lb/acre on the wet meadows. Based on production estimates and current stocking rates, it can be concluded that stocking rates of 4 to 6.5 AUMs can be supported by the wet meadow parcels and would not be expected to negatively affect the baseline conditions of wetlands and special-status plant species populations.

Performance monitoring of the condition and extent of wetland and special-status plant species will be used to determine whether the stocking rates should be adjusted to benefit the target mitigation resources. The performance standards and monitoring methods for wetland and special-status plant mitigation are presented in Chapters 9 and 10, respectively, of the 2012 State MMP.

The stocking rate on the Taylor Ranch is about 65 cows/980 acre or about 0.065 AUMs per acre (15 acres per AUM). While the Oak Woodland Management Unit (OWMU) produced more than 3,000 lb/acre of forage in 2010–2011, about half of the area is dense tree and shrub canopy cover and produces little forage. The Taylor Ranch is leaving RDM greater than 1,500 lb/acre. Based on the rangeland production, data it can be concluded that the OWMU can be stocked at a rate of 15 to 20 acres per AUM.

3.3 Kind and Class of Animal

3.3.1 Beef Cattle

The preferred kind and class of animal for grazing the mitigation parcels is all age classes of beef cattle (i.e., cows, heifers, calves, stockers, and bulls). Historically, Little Lake Valley has been grazed by cattle, and native habitats on the parcels have been able to persist over many decades of grazing. Currently, all classes of beef cattle graze on the mitigation parcels. Because grazing typically is deferred until May, grass in the parcels can be quite tall and will have begun to

flower by the time grazing begins. As bulk feeders (i.e., not very selective), beef cattle can process and survive on this large amount of grass better than sheep or goats.

3.3.2 Sheep and Goats

There are a few sheep flocks and goat herds in Little Lake Valley. Sheep are intermediate feeders that can process grass but prefer forbs. Goats are browsers and could adversely affect desired woody vegetation. Sheep and goats with their more precise prehensile organs (lips) are more adept at selecting (nibbling) a high-quality diet from the forage available. While goats and sheep are less effective at processing the tall forage that can accumulate on the wet meadows, sheep could be an acceptable alternative as long as they were managed to meet RDM targets. Goats can be difficult to contain with standard fences. When targeting certain weeds or woody vegetation for control, sheep and goats may be the preferred grazer. Over the past decade many sheep and goat operations have been formed to manage vegetation for a fee.

3.4 Targeted Grazing

Targeted grazing is a recent term that defines the application of a specific kind of livestock at a determined season, duration, and intensity to accomplish defined vegetation or landscape goals. This term often is used for weed control or vegetation management using grazing or browsing animals. This concept has been around for decades and has taken many names, including prescribed grazing and managed herbivory. The major difference between traditional grazing management and targeted grazing is that targeted grazing refocuses outputs of grazing from livestock production to vegetation management and landscape enhancement.

There is growing evidence that cessation of grazing may have detrimental effects on native flora and fauna. Grazing is increasingly recognized as a means of managing competition from aggressive herbaceous vegetation. Targeted grazing has proven valuable for managing vernal pools in California's valley grasslands (Marty 2005), managing vegetation for Bay checkerspot butterfly (*Euphydryas editha bayensis*) populations in serpentine grasslands (Weiss 1999), Santa Cruz tarplant (*Holocarpha macradenia*) and annual wildflower displays (Hayes 1998), and native annual forb richness and cover (Hayes and Holl 2003).

Grazing by livestock may enhance grassland species diversity through the classical mechanism of reducing biomass and slowing competitive displacement (MacNaughton 1968; Noy-Meir 1995; Collins et al. 1998) or by increasing vegetation patchiness (Briske et al. 2011). Grazing also is used by conservation-oriented grassland managers to suppress exotic species and enhance native species (e.g., Menke 1989; Thomsen et al. 1993). In general, grazing is expected to have

stronger positive effects on diversity in systems with higher productivity (e.g., Grime 1979; Milchunas et al. 1988; Proulx and Mazumder 1998).

Targeted grazing also has been shown to benefit wildlife habitat. The U.S. Fish and Wildlife Service (USFWS) (2004, 2005) recognized that grazing adjacent to stock ponds and maintenance of stock ponds can provide suitable breeding and summer estivation habitat for California red-legged frog (*Rana draytonii*) and California tiger salamander (*Ambystoma californiense*). Germano and coauthors (2001) found that the cover of nonnative grasses and forbs often creates an impenetrable thicket for small, ground-dwelling vertebrates. An ongoing long-term study in Kern County has found that several animal populations are often greater on grazed plots than in ungrazed plots, including short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*), giant kangaroo rat (*Dipodomys ingens*), sage sparrow (*Amphispiza belli*), horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and blunt-nosed leopard lizard (*Gambelia sila*) (Germano et al. 2006). Giant kangaroo rat and blunt-nosed leopard lizard are both federally and State-listed as endangered.

Without vegetation management, there is severe risk of excessive fine fuel buildup that could result in a wildfire. Targeted or prescribed grazing reduces fine fuel loads and can have the potential to be an ecologically and economically sustainable management tool for reduction of fuel loads. Existing data indicate that grazing reduces fine fuel loads, and it therefore can modify both fire frequency and fire intensity (Nader et al. 2007; Briske et al. 2011). This interpretation is supported by the well-documented inverse relationship between stocking rate and aboveground herbaceous standing crop (Bement 1969; Milchunas and Lauenroth 1993; Manley et al. 1997; Derner and Hart 2007). Fuel management studies have shown that spread rate and flame length decrease as dry grass fuel loads decrease (Scott and Burgan 2005). Diamond and coauthors (2009) showed that targeted grazing reduces biomass and cover of the invasive annual *Bromus tectorum*, resulting in reductions in flame length and rate of spread. Recent studies in Idaho have shown that livestock grazing is an effective means to reduce fuel loads (Weber, et al. 2011). Tsiouvaras and coauthors (1989) reported that grazing by goats effectively reduced 1- and 10-hour fuel load in coastal forest areas of California.

3.4.1 Target Grazing for Special Status Species

Experimental application of targeted grazing offers an opportunity to test different season, intensity and frequency of grazing effects on BM and NCSG to fine tune management over time. These management experiments must follow an adaptive management approach that incorporates monitoring of plant population characteristics such as density, spread, cover, and regrowth following grazing. For example the effect of no grazing, and various intensities of grazing could

be tested during the initial years of the project for the purpose of improving the application of grazing to maintain, increase and manage these species. Likewise different seasons of grazing and rest period following grazing could be tested to determine their effect on BM and NCSG. These tests could be compared in adjacent small pastures or in smaller sections of large pastures using temporary electric fencing.

3.4.1.1 TARGETED GRAZING FOR BAKER'S MEADOWFOAM

The results of vernal pool grazing experiments in Sacramento County and observations on the mitigation parcels of improved BM cover and density with grazing (Hulse-Stephens pers. comm.) suggest that properly timed grazing may help to maintain BM populations.

Field experiments by Jamie Marty (2005) on annual rangeland vernal pools in the Sacramento Valley have shown that when cattle are removed from grazed vernal pool grasslands, native plant diversity can decline and nonnative species abundance can increase. Marty believes that "decline in native plant cover and diversity in the ungrazed treatments was most likely caused by the significant increase in grass cover" that competes for soil moisture and light resources. Increased evapotranspiration rates due to high annual grass cover may be the cause of dramatic decrease in pool inundation periods, although Marty also theorized that decreased soil compaction in the absence of grazing could have negatively influenced pool hydroperiod. Invertebrate taxa richness also declined in pools that were ungrazed or had shorter grazing periods. This is most likely due to altered pool hydrology, especially an increase in the number of pools that dried completely during the wet season. Marty's results also show that prolonged inundation in the absence of grazing is not enough to keep exotic species out of the pools. Edge and upland zones (compared with pool bottoms) were the most negatively affected by grazing removal, with marked declines in native species richness and relative cover of natives.

While these results lend support for grazing to maintain BM populations, there is a great deal about the growth and competitive ability of BM and the effect of grazing on BM populations that is not known. Without research-based information, an adaptive management process must be followed to manage species that compete with BM. Using the knowledge and observations that are available, a targeted grazing prescription can be developed and tested following adaptive management procedures, including close monitoring.

Following is information that is pertinent to the development of targeted grazing prescriptions.

- BM is State-listed as rare and is on California Native Plant Society (CNPS) List 1B.1. This species is restricted to Mendocino County and there are 21 reported occurrences, including populations in Little Lake Valley, Laytonville, and north of Covelo (California

Natural Diversity Database 2009). BM is an annual herb that occurs in wet meadows, seeps, freshwater marshes and swamps, vernally mesic areas in grasslands (e.g., swales), and vernal pools at elevations of 574–2,985 feet above mean sea level. The reported blooming period of BM is April–May (California Native Plant Society 2012).

- Like other annual species in a Mediterranean climate, seeds of BM germinate with rains in the fall and winter. Like other annuals, BM grows slowly during the winter and more rapidly with warming spring temperatures in March, April, and May (George et al. 2001). Plants covered by too much litter produce a long, weak seedling (commonly called an *etiolated seedling* in botany and plant physiology textbooks) as the plant attempts to grow toward sunlight. These seedlings will not survive. In Little Lake Valley, BM usually flowers and sets seed in mid- to late May. BM patches that are closely grazed (lower RDM) have been observed to have higher BM densities than patches with higher RDM. Some believe that livestock trampling may ensure coverage of BM seeds with soil and enhance the next season's germination rate.
- Seeds of other annual plants that may compete with BM also germinate with the first fall rains and grow slowly during the winter and more rapidly with warming spring temperatures in March and April (George et al. 2001). Introduced perennial grasses that may compete with BM also begin growth with the first fall rains and enter a period of rapid spring growth with warming spring temperatures that can result in excessive shading of BM before the grazing season starts in May. Wet meadow vegetation will produce around 1,000 lb/acre/month or more in March and April, ensuring there will be 2,000 or more pounds per acre of standing crop, which may be 8 to 12 inches tall or more by the beginning of the grazing season in May. Flower induction and culm elongation in May and June will result in height increases to 3 to 5 feet. Therefore, to reduce shading of BM during the remainder of its growing season and during flowering and seed set in May, grazing to reduce grass height and partially suppress flowering should be applied as soon as possible in the spring.
- It has been observed that cattle do not eat BM (Hulse-Stephens pers. comm.). There is uncertainty about sheep and goat preferences for BM. If sheep and goats eat BM, their use should be deferred until after BM seed set.
- Seasonal grazing from May through October allows introduced perennials to grow unchecked during March and April. If introduced perennials are not grazed early in May, they may reach 3 feet or more in height before flowering and seed set of BM in mid to late May. Earlier grazing in April may reduce shading of BM from competing perennial grasses.

- Year-long continuous grazing allows grazing during rapid spring growth, which can suppress growth of introduced perennials. This practice can work where BM patches are adjacent to upland soils, such as those on the eastern Watson parcel.
- Grazing through the summer and early fall reduces the height of introduced perennials and reduces litter. An RDM target of 1,000 to 1,500 lb/acre will provide for this reduced height without increasing erosion risk or reducing the filtration capacity of the ground cover.
- Removal of grazing results in reduced density and area of BM.

Given what is known and the uncertainty of what is not known, BM patches should be grazed to reduce competition and to improve seed contact with the soil following the guidelines recommended in Appendix B. Application of these guidelines should be conducted using an adaptive management approach informed by monitoring so that grazing practices can be fine-tuned over time.

3.4.1.2 TARGETED GRAZING FOR NORTH COAST SEMAPHORE GRASS

As is true for BM populations, there is a great deal about the growth and competitive ability of NCSG and its response to grazing that is not known. Likewise, without research-based information, an adaptive management process must be followed to manage species that compete with NCSG.

Following is information that is pertinent to the development of targeted grazing prescriptions.

- NCSG is State-listed as threatened and is on CNPS List 1B.1. This species is known from 24 occurrences in Mendocino, Marin, and Sonoma Counties (California Natural Diversity Database 2009). In Mendocino County, there are reported occurrences near the town of Cahto, near Comptche southwest of Willits, in Mendocino Pass east of Covelo, and in areas west of the project vicinity near Boonville (Smith and Wheeler 1991; California Natural Diversity Database 2009). Additionally, nine occurrences have been documented west of Ukiah on the Orr Springs USGS 7.5-minute quadrangle in the vicinity of Low Gap.
- NCSG grows in meadows, seeps, openings, and mesic areas in broadleaved upland and North Coast coniferous forest at elevations of 33–2,201 feet above mean sea level. The reported blooming period of NCSG is April–June (California Native Plant Society 2012). This species most commonly is associated with forest and woodland edges and other partially to fully shaded mesic sites. Field surveys conducted in 2007, 2008, 2009, and

2010 located occurrences of NCSG both within the bypass project footprint and on the offsite mitigation parcels.

- Competitors to NCSG, primarily introduced pasture grasses, grow rapidly in April and May potentially beginning to shade NCSG. These introduced competitors will reach heights of 3 to 5 feet by June, shading associated NCSG plants.
- NCSG is a perennial grass that regrows each year, entering a period of rapid growth with warming spring temperatures.
- NCSG occurs in aggressive stands of introduced perennial grasses that can shade NCSG. Grazing and mowing can reduce shading of competing species.

Following an adaptive management approach, grazing and mowing should be applied following the guidelines recommended in Appendix C.

3.5 Riparian Corridors

The USACE MMP and State MMP require fencing of all riparian corridors. The USACE requires fencing of all wetland rehabilitation (i.e., ungrazed wetland rehabilitation) and establishment areas offered as USACE mitigation. Since corridor grazing is not permitted under the project's permit conditions livestock access to riparian corridors will be limited to moving livestock between pastures at designated stream crossings. In some cases it may be useful to graze riparian corridors and may be permitted by the State regulatory agencies. Appendix F presents riparian corridor grazing guidelines for the offsite mitigation parcels that could be implemented by the Land Manager during the long-term management period. At no time are riparian areas that double as USACE mitigation allowed to be grazed. This section describes the potential beneficial and adverse effects of riparian corridor grazing.

In response to the general effects of grazing on riparian vegetation, water quality, and aquatic habitat, permanent exclusion of livestock from riparian areas, especially riparian corridors and streams, has become widespread among agencies, policy makers and conservation groups. However, research in the past 15 years and natural barriers along some corridors in the mitigation parcels suggest that complete fencing of all corridors may not be necessary or desirable. The intended benefit of corridor fencing is exclusion of livestock from restoration activities and streambanks, but fenced corridors also will create a vegetation buffer that attenuates pollutants and provides wildlife habitat and movement corridors. In Little Lake Valley, existing corridors and fence lines often are invaded by Himalayan blackberry.

3.5.1 Livestock Exclusion

It is natural behavior for beef cattle and other livestock to disproportionately occupy riparian areas because of the quality forage, shade, and water found in these areas. The negative results of this behavior on riparian vegetation, streambanks, and aquatic habitat are well-documented, often resulting in exclusion of grazing from riparian and other areas by habitat managers (Larsen et al. 1998; George et al. 2011). However, studies applying livestock distribution modification techniques have shown that livestock residence time in riparian zones can be substantially reduced (Bailey 2004, 2005; George et al. 2007). Distribution of beef cows and other livestock can be altered by providing offsite water and strategically placing mineral and protein supplements and shade. Recently USDA published a national report confirming the effectiveness of these practices based on a 2-year analysis of peer-reviewed literature (George et al. 2011). The conclusion is that exclusion of livestock from riparian areas is generally unnecessary if the vegetation is established and proper grazing practices are applied.

3.5.2 Vegetation Buffers

Riparian corridor setbacks produce a riparian buffer that can attenuate pollutants (sediment, nutrients, microbial pollutants, and pesticides). Based on several review papers and 41 peer-reviewed reports of research from a wide range of grazed, agricultural, and urban systems, the overriding message is that: (1) vegetative buffers can attenuate some portion of most waterborne pollutants transported to them during overland and floodflow events; and (2) there is significant variation in buffer attenuation efficiency attributable to site-specific factors (George et al. 2011).

These site-specific factors include buffer width, slope, vegetation attributes within the buffer; pollutant type and attributes; pollutant load entering the buffer; overland or floodflow rate entering the buffer; hydrologic residence time within the buffer; riparian soil attributes within the buffer; and buffer vegetation management (George et al. 2011). During periods of inundation, nutrients, pathogens, and sediment may be flushed from the buffer regardless of its width. While site factors determine buffer efficiency, agencies and managers must decide on an acceptable level of water quality–degradation risk in determination of buffer width. As risk tolerance decreases, buffer width must increase.

There is a consistently positive correlation between vegetative ground cover, plant stem density, and buffer filtration efficiency for several pollutants, and these same plant attributes are important for determining stream channel and riparian soil stability (George et al. 2011). However, studies at the University of California Sierra Foothill Research and Extension Center (17 miles northeast of Marysville, California) have shown that harvesting buffers significantly

improved nitrogen attenuation from both surface and subsurface waters (Bedard-Haughn et al. 2004, 2005). Conversely, not harvesting the riparian buffer results in the buffer becoming a nitrogen pollution source. Buffer harvesting may be limited to periodic grazing or mowing. If buffers contain woody plants, rocks, or other obstructions, mowing may not be a choice. In narrow buffers, especially with dense woody vegetation, sheep or goats may be a better choice for grazing buffers than cattle.

Additional studies by the California Rangeland Watershed Laboratory (Appendix D) show that (1) substantial pollutant removal can occur with a grass/forb buffer of only a few meters width, (2) wetlands provide significant capacity to remove surface water pollutants, and (3) *Cryptosporidium parvum* and other pathogens do not survive spring and summer heating of pasture manure deposits and their overland transport is very small (George et al.2011).

3.5.3 Himalayan Blackberry

Studies of the effect of grazing on Himalayan blackberry in Australia (Amor 1974) indicate:

> In an ungrazed area, 96% of the plants produced daughter plants; in areas grazed lightly by horses the number dropped to 11%; in areas grazed by cattle only 1% of all plants had daughter plants; and no plants had daughter plants in areas grazed by sheep.

3.5.4 Corridor Fences

Along many riparian corridor reaches on the mitigation parcels, an existing woody plant buffer is in place on each side of the stream channel. This buffer excludes livestock from the channel along much of its length. These corridors do not require fencing along the entire corridor, but where points of penetration exist, strategically placed fencing could close these access points and allow woody vegetation to gradually fill the access point (natural restoration). To support grazing management as well as general land management activities, riparian corridors should have hardened crossings for vehicles, management staff, and livestock. The crossing should be hardened with concrete, small rock, or some other material to protect streambanks and to further minimize entrainment of sediment in the water column during crossings by animals or vehicles. Permanent stream crossing were designed by Caltrans using the USDA NRCS recommendations. The resources agencies have been given an opportunity to review and comment on the design. Caltrans incorporated their comments where possible. The crossings will be constructed as part of the mitigation program implementation.

Cattle crossing unprotected stream channels potentially contributes to the sediment load in the channel. Sediment from livestock will end once riparian corridors are fenced and hardened crossings are installed. Crossing a hardened channel only stirs sediment deposited in the crossing from upstream; it does not add sediment to the systems.

3.5.5 Riparian Pasture

The concept of a riparian pasture is not new. Enclosing riparian corridors within a pasture that can be managed separately from surrounding land can exclude grazing when streambanks are vulnerable to trampling damage and permit grazing at times when risk of stream channel impacts is minimal. Riparian pastures facilitate flash grazing to control weeds. Protection from grazing during restoration will allow woody plant growth that eventually protects the stream channel. Himalayan blackberry and other well-developed woody plants effectively will restrict livestock access to the stream channel.

3.5.6 Oak Plantings

Oak plantings can be protected by an exclosure fence or within a grazed area if they are protected with a tree shelter until the plants are 5 to 6 feet tall. Reports by McCreary (2001) and McCreary and George (2005) demonstrate that oak seedlings planted in a grazed pasture should be protected by a tree shelter supported by a fence post (metal t-post). The reports indicate only a small percentage of oak seedlings survived to Year 4 whether fenced to prevent livestock access or not fenced. With tree shelter and grazing access, 58% of the oak seedlings survived to Year 4.

3.6 Monitoring Grazing Practices

3.6.1 Purpose

Adaptive management of grazing depends on monitoring that will be used to inform lessees and Land Managers of the current vegetation conditions. Monitoring recommendations are presented in Chapter 5. Monitoring of grazing should include monitoring RDM and keeping basic pasture use records, such as in and out dates and number of head.

The purpose of monitoring is to:

- Determine the overall status and condition of the management unit.
- Identify whether grazing treatments are effective to support rehabilitation of wetlands and improve water quality.
- Identify whether grazing treatments are providing desired forage conditions.
- Identify any problems so that appropriate remedial actions can be taken.
- Document grazing management activities conducted on the offsite mitigation parcels.

3.6.2 Residual Dry Matter Monitoring

For the rangelands on the parcels, a minimum of 1,000 lb/acre of RDM should remain at the end of the grazing season (October or November). For seasonal wet meadow on the parcels, the RDM on seasonal wetland meadows should be no lower than 1,500 lb/acre at the end of the grazing season (October or November). These levels will ensure protection of soil, perennial plant growing points that support plant regrowth, and adequate carbohydrate reserves to survive the winter and the dry season. RDM should be visually estimated annually for each grazed and ungrazed management unit using photo-guides (Guenther 1998) just before the start of the rainy season. Monitoring RDM occasionally has been extended to pastures and meadows as done in this project.

Buildup of plant litter such that it forms a thatch is detrimental to vegetation growth, vigor, and competitive ability. Historically, periodic fire has prevented a buildup of thatch. With today's longer fire return intervals, grazing becomes an important means of reducing thatch and preventing its accumulation. The RDM targets recommended in this plan are a balance between preventing thatch buildup and preventing overuse of the grazed parcels. If thatch is not removed by the existing grazing practices, it may be necessary to increase stocking rate and extend the grazing period. Haying and controlled burns also may be used to reduce thatch.

RDM can be measured by clipping or by double sampling methods such as comparative yield (Bartolome et al. 2006). RDM can be estimated visually using photo-guides (Guenther 1998). Visual estimates based on photo-guides is a cost-effective means of documenting landscape conditions that requires little time but becomes a valuable record over time (McDougald et al. 2003). Digital photos of RDM levels from permanent points can supplement the visual estimates. Each year different people may do RDM monitoring on the mitigation parcels. To minimize the long-term costs of RDM monitoring and to ensure accurate assessments by different people, the

use of a standard set of photo-guides is recommended to determine whether a pasture or vegetation patch meets the recommended RDM level.

RDM targets are recommended in this plan, and photo-points have been established in each management unit. The photo-points have been geo-positioned, and the first set of photos was collected in 2011. Livestock impact and RDM are more properly assessed in the late summer or early fall before the first fall rains and after 5 to 7 months of grazing. A few livestock impact areas around water troughs and at gates and stream crossings were identified in June 2011.

3.6.3 Invasive Species Monitoring

The State MMP contains guidelines for monitoring of NCSG and BM populations and invasive plants. The State MMP provides extensive discussion of the vegetation monitoring and performance standards for invasives, BM and NCSG, and all other resources covered under the plan that will be implemented for the first 5 or 10 years of the project, depending on the resource. The mitigation monitoring results, in combination with the GMP, will be used to refine the grazing practices as needed.

Monitoring needs to be able to detect change in invasive species composition on a site-specific basis. For example, medusahead is present in the South Management Unit (SMU) and the NMU. It will be difficult to monitor these infestations as they occur as many small (a few square feet) patches are present. Photo-monitoring and global positioning of selected patches can detect reductions and increases in patch size. A landscape photo in late April or May, when medusahead is green and flowering and most other vegetation is dry, should provide an adequate indicator of pasture-level change. Yellow starthistle also occurs in patches and could be photo-monitored in May or June in much the same way as medusahead.

3.6.4 Records

Maintenance of pasture use records is part of monitoring. Records of kinds, classes, and numbers of livestock and their pasture in-dates and out-dates are basic information that should be required in all grazing lease agreements. From this information, stocking rate can be calculated. Records should include date of the first and last rains, and rainfall amounts, so that the length of the rainy season and dry season can be estimated and recorded. A manager responsible to Caltrans should maintain these records.

Performance Standards

Performance standards for resources affected by this GMP are found in the State MMP. Monitoring methods that will detect change in condition or abundance have been established for each resource and are described in the State MMP.

3.6.5 Adaptive Management

Similar to methods used by farmers and ranchers for decades, adaptive management is a form of management based on experimentation (trial and error). Guided by objectives and performance standards, adaptive management allows Land Managers to monitor and evaluate management practices through time. Documenting adaptive management processes with monitoring can help resource professionals learn from these management actions, while maintaining information feedback to the Land Manager. Adaptive management of the mitigation parcels provides the Land Manager flexibility to change the grazing prescription based on monitoring findings, as well as managing the landscape in response to drought, fire, flooding, and other disturbances. The ability to allow adaptive management often determines success in grazing management.

It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.

Following are some examples of decisions that are the responsibility of the Land Manager.

- Monitor grazing and inform lessees of needed changes.
- Control patches of invasive plant species following the guidelines in Chapter 4.
- Adjust stocking rate during drought.
- Adjust stocking rate following fire.
- Modify the RDM targets based on seasonal and annual variations in vegetation growth.
- Test different stock densities, grazing seasons, or rotations on NCSG and BM patches.
- Maintain and repair all infrastructure on grazed parcels and on ungrazed parcels if it affects the management of the leased pastures and grazing.

3.6.6 Management Responsibility

Adaptive management is active management. On the mitigation parcels the grazing lessees are currently the active managers, but they are each focused on their own livestock enterprises. The Caltrans mitigation parcels need a grazing manager to ensure that grazing is applied in accordance with the grazing plan; fences and other infrastructure are maintained and functioning; ungrazed areas are not grazed; weed populations are controlled; and monitoring of RDM, BM density, NCSG density, and weed populations is completed.

The Land Manager responsible for implementing the MMP should have practical experience managing rangeland, pasture, and grazing and have strong communications skills. This manager would be responsible for day-to-day management of the mitigation parcels, maintenance of grazing records, communication with the lessees, and monitoring. Initiation of a grazing association made up of the lessees would facilitate communication among the grazing manager, Caltrans, and the lessees.

Training and communications are crucial to successful adaptive management. Special training sessions for the Land Manager and for lessees should facilitate adaptive management and communications. An example of a possible special training scenario would be the University of California Cooperative Extension and the Mendocino County Resource Conservation District (MCRCD) organizing and conducting needed training. Likewise, if funding is available, onsite research and demonstrations could inform management how to refine grazing to meet mitigation objectives.

Chapter 4 Invasive Species Management Practices

4.1 Himalayan Blackberry

Himalayan blackberry is a perennial vine/shrub of the rose family (Rosaceae). Contrary to its name, Himalayan blackberry is native to Western Europe and probably was introduced to North America as a cultivated crop. It seeds heavily, and seeds are readily dispersed by mammals and birds. Seeds can be spread considerable distances by streams and rivers (Hoshovsky 2000). It also spreads vegetatively by rooting of cane tips. The plant first appears as individual canes that eventually can grow to 20 to 40 feet long. This plant frequently roots at the nodes or tips of the canes, spreading in an ever-larger area around the central plant. Himalayan blackberry is problematic because it displaces native riparian understory plants through formation of a large and impenetrable mound of vegetation. Himalayan blackberry occurs on several offsite mitigation parcels. It typically occurs as a riparian understory species and in some locations has begun to exclude the regeneration of riparian species. Himalayan blackberry occurs on pastures adjacent to streams and in isolated locations in wet meadow.

4.1.1 Grazing

Targeted grazing using goats, sheep, or cattle (in descending order of preference) will remove the aboveground material, but repeated close grazing will be required to kill the plant and, as in mechanical control, some resprouting will occur. If cattle are used, they may require training to eat the plant (Voth 2010). Temporary electric fencing may be required to hold the animals at the high density required to achieve control.

4.1.2 Chemical Control

The most effective control method other than grazing is repeated herbicide applications using a cut-and-paint treatment of the canes until the entire plant dies. An effective method to reduce the quantity of herbicide used is to cut and clear existing canes and apply herbicides to the cut vines or to the new vegetative growth.

Herbicides used to control wild blackberry during the growing season include glyphosate, dicamba, dicamba/2,4-D combinations, and triclopyr. Certain herbicides such as Garlon 3A

(triclopyr) and Roundup (glyphosate) have been successful at controlling blackberry after fall application on mature and new canes (Soll 2004).

Spraying the foliage tends to be more effective during the summer months (Hoshovsky 2000), and spot application on the cut canes, injection into the canes, and spraying newly emergent plants tend to be more effective in the fall (Soll 2004). The herbicide applicator should refer to herbicide labels for site-specific control information. A nonionic surfactant should be used to increase effectiveness of most herbicides.

4.1.3 Mechanical Methods

The following mechanical methods can be used to remove Himalayan blackberry.

- Excavating the root crowns and large roots.
- Repeatedly removing the aboveground vegetation with a string trimmer or mower and densely planting native vegetation that would shade the Himalayan blackberry (Soll 2004).
- In more mature infestations, removing the aboveground vegetation with tools before removing the belowground root crown and roots with shovels or a claw/Pulaski mattock (Soll 2004).

All of these methods can be effective, yet very labor-intensive and therefore expensive (Soll 2004). All three actions involve repetition. Aboveground cutting needs to be repeated several times a year for several years, and the belowground removal needs additional removal of new sprouts for several years. As a general guide, 300–1,000 hours of labor are required to remove Himalayan blackberry from 1 densely infested acre (Soll 2004).

4.1.4 Burning

Burning may be effective for removing the aboveground portions of the plant, but it will not kill the plant completely, as the plant will resprout (Tirmenstein 1989). Liability and air quality regulations limit the use of fire. Drip torches may be used to treat resprouts, but this can be labor-intensive because it requires repeated applications.

4.1.5 Proven Local Method

Experience has shown that Himalayan blackberry can be controlled by first cutting the vines with a brush hog and then grazing to eat fresh regrowth and trample the blackberry canes.

4.2 Common Teasel

Common teasel (*Dipsacus fullonum* ssp. *sylvestris*) is a monocarpic perennial (Wisconsin Department of Natural Resources 2004). It was introduced from Europe into North America in the 1700s. The plant grows as a basal rosette for a minimum of 1 year, then sends up a tall, flowering stalk and dies after flowering. The rosette stage varies according to the amount of time needed to acquire enough resources for flowering to occur. During the rosette stage, leaves change from being somewhat ovoid in the younger stage to large, oblong, and quite hairy in the older stage. Teasel develops a large taproot during the rosette phase. The taproot may be more than 2 feet long and 1 inch in diameter at the crown. Teasel grows in open, sunny habitats that range from wet to dry soil levels. Optimal conditions seem to be mesic habitats. Roadsides and heavily disturbed areas are the most common habitats of teasel.

Common teasel blooms from June through October. Flowering plants have large, oblong, opposite, sessile leaves that form cups (the cups may hold water) and are prickly, especially on the lower midrib. Stems are also prickly. Teasel's unique inflorescence makes the plant readily identifiable when flowers or seed heads are present. Flowers are small and packed in dense, oval-shaped heads. The flowers are subtended by stiff, spiny bracts that are located terminally on the flowering stems. Common teasel generally has purple flowers. Flowering stems may reach 6–7 feet in height.

Teasel is an aggressive exotic that forms extensive monocultures. Teasel produces an abundance of seeds. A single teasel plant can produce more than 2,000 seeds, and 30–80% of the seeds may germinate. Seeds may remain viable for up to 2 years. Seeds typically do not disperse far, and most seedlings will be located near the parent plant. However, highway mowing equipment and inappropriate disposal of dried teasel heads from flower arrangements can increase the spread. Seeds may also be water-dispersed, which allows dispersal over longer distances. Dead adult plants leave a relatively large area of bare ground formerly occupied by their own basal leaves, providing an optimal nursery site that new teasel plants readily occupy. Immature seed heads of cut-leaved teasel are capable of producing viable seed.

4.2.1 Grazing

There is limited information on grazing teasel because it is commonly rejected by most grazing animals. Goats have been used to manage teasel in Colorado where they have been observed to eat flowers, leaves, and stems (Lamming 2001). The objective for grazing teasel would be to prevent or suppress flowering so that the next crop is reduced. Targeted grazing may be

effective, especially if high livestock densities are employed through the use of electric fencing. Grazing animals may need to be trained to eat teasel as most find it unpalatable.

4.2.2 Chemical Control

A variety of herbicides will control this biennial plant if applied to rosettes in the spring or fall. Applying 2,4-D amine at a rate of 1 pound active ingredient per acre (ai/A) is effective. Triclopyr as Garlon 3A, applied at 1 pint per acre to actively growing plants, is also effective. The sulfonyl urea compound chlorsulfuron (0.75 ounces ai/A) may be applied to actively growing teasel in the rosette stage. While these two products give long-term broadleaf control, they may interfere with establishment of native species for several years. A nonionic surfactant should be used to increase effectiveness of most herbicides.

4.2.3 Mechanical Methods

The key to controlling teasel is to prevent seed production while exhausting the seed bank. Research suggests that teasel does not reproduce if sufficient root is removed by digging. In natural areas or lightly infested areas, flowering stems can be cut and bagged for disposal. If the stalk is cut prior to flowering, the weed will send up a new flowering stalk. If repeated removal is provided after flowering and before the seed is mature or has been released, the spread of teasel can be prevented.

Mechanical methods can be used in combination with grazing, chemical control, and burning. Mechanical control of the previous year’s vegetation and removal of tall current year growth allow easier access to apply other treatments.

4.2.4 Burning

Prescribed burns may be used to make teasel rosettes easier to find; however, fire will not carry well through dense stands of rosettes or mature plants. Drip torches may be used to treat resprouts, but this can be labor-intensive because it will require repeated applications. Burning alone will not likely eradicate populations, and liability and air quality regulations restrict its use.

4.3 Reed Canarygrass and Harding Grass

Because the control methods for the closely related reed canarygrass and Harding grass are the same, the discussion of management actions is combined in this section.

Reed canarygrass and Harding grass are both introduced perennial pasture grasses. Reed canarygrass differs from Harding grass in having more distinct rhizomes and an inflorescence that is compact at first but later becomes more open as the branches spread. Hybrids of Harding grass and reed canarygrass have been produced. There is often confusion in identification between reed canarygrass and Harding grass and orchard grass and bluejoint reedgrass (*Calamagrostis canadensis*). Orchard grass is also an introduced perennial pasture grass. Bluejoint reedgrass is a native perennial grass.

Reed canarygrass is a large, coarse grass that reaches 2 to 9 feet in height (Wisconsin Department of Natural Resources 2009). It has an erect, hairless stem with gradually tapering leaf blades 3½ to 10 inches long and 1/4 to 3/4 inch in width. Blades are flat and have a rough texture on both surfaces. The lead ligule is membranous and long. The compact panicles are erect or slightly spreading (depending on the plant's reproductive stage), and range from 3 to 16 inches long with branches 2 to 12 inches long. Single flowers occur in dense clusters in May to mid-June. They are green to purple at first and change to beige over time. This grass is one of the first to sprout in spring and forms a thick rhizome system that dominates the subsurface soil. Seeds are shiny brown in color.

Reed canarygrass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800s for forage and erosion control. It has become naturalized in much of the northern half of the U.S. and still is being planted on steep slopes and banks of ponds and created wetlands. This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, streambanks, and seasonally wet areas. It also grows in disturbed areas such as berms and spoil piles.

Reed canarygrass reproduces by seed or creeping rhizomes. It spreads aggressively. The plant produces leaves and flower stalks for 5 to 7 weeks after germination in early spring and then spreads laterally. Growth peaks in mid-June and declines in mid-August. A second growth spurt occurs in the fall. The shoots collapse in mid to late summer, forming a dense, impenetrable mat of stems and leaves. The seeds ripen in late June and shatter when ripe. Seeds may be dispersed from one wetland to another by waterways, animals, humans, or machines. Over time, it forms large, monotypic stands that harbor few other plant species. Once established, reed canarygrass dominates an area by building up a tremendous seed bank that eventually can erupt, germinate, and colonize other locations.

Native to the Mediterranean region, Harding grass has been dispersed throughout the world by agronomists and farmers for its value as forage in pastures (California Invasive Plant Council).

Its main agronomic value is its ability to tolerate conditions of low moisture, heavy grazing, and winter trampling and compaction by livestock (Langer 1990). Once planted widely for forage, it continues to colonize new areas through spread by seed. Seeds are disseminated short distances primarily by wind and by animals, while long-distance spread is through human activity.

4.3.1 Grazing

Grazing alone does not control reed canarygrass and Harding grass. Cattle prefer these species when stems and leaves are young and succulent, but do not prefer it once stems become mature and toughen. Goats and sheep will graze on young or mature reed canarygrass and Harding grass but prefer young growth. Grazing to control these grasses would require long-term, frequent, close grazing over several years. During this time other invasive species may occupy the gaps created by heavy grazing. Grazing can be combined with another treatment method and then followed by herbicide or shade cloth for good control.

4.3.2 Chemical Control

Several herbicide choices are available to control reed canarygrass and Harding grass; however, most other herbicides also will control the desirable native grasses as well. Spot application by hand using a rope wick applicator can minimize impacts on non-target species. A nonionic surfactant should be used to increase effectiveness of most herbicides. The following chemical methods can be used to control reed canarygrass and Harding grass.

- Apply 1.2–2.25 lb acid equivalent/acre glyphosate when the plants are at early heading or in fall.
- Apply 0.25–0.375 lb acid equivalent/acre fluazifop (1 to 1.5 parts product [Fusilade DX]/A) applied to actively growing plants. Not registered for wetland areas but may be okay for seasonal wetlands.
- Apply 0.5–1.0 lb acid equivalent/acre imazapyr (Habitat® is registered for aquatic sites, including wetlands). Apply in boot stage through the fall when the plant is actively growing.

Herbicidal control used in conjunction with mechanical methods also works well. The quantity of herbicides can be reduced if the mature or tall vegetative growth is cut and cleared and herbicides are applied to the new vegetative growth.

4.3.3 Mechanical Methods

Isolated plants or small patches of reed canarygrass and Harding grass can be successfully removed by digging out and removing the entire root mass. Removal is easiest when the soil is moist. All rhizomes and roots will need to be removed, as small rhizome fragments can resprout. The excavated root masses should be properly disposed of because plant material (rhizomes and stems) can develop new roots if inundated or if kept in contact with moist ground. Follow-up treatment may be required to remove any resprouted stems. Henderson (1987) found hand-pulling of reed canarygrass was effective if done over the entire population two to three times per year for 5 years. Although excavation can be effective, it is not cost-effective over a large area and may be prohibited if the populations occur in wetlands or in association with special-status plant species.

4.3.4 Mowing/Cutting

Mowing or cutting alone using a mower, brush cutter, weed eater, tractor-drawn mower, or machete will not kill reed canarygrass and Harding grass. In fact, mowing these species only once or twice per year actually stimulates additional stem production. Continued mowing (five times or more per year) for 5 to 10 years is reported successful in controlling reed canarygrass, but this has not been demonstrated on a large scale. It is not known whether this method is effective for Harding grass.

Mowing can be used effectively in combination with another control method, such as following with an herbicide application. Additionally, mowing prior to or at the onset of flowering can eliminate seed set for that year. Mowing also can facilitate the installation of shade cloth, or be used as a pretreatment for tillage, because it will remove or break up thick thatch and layers of dead litter.

4.3.5 Solarization, Shade Cloth, and Mulching

Hoffman and Kearns (1997) suggest covering reed canarygrass infestations with black plastic (solarization). They claim that for this method to be successful, light levels should be reduced to less than 40% of normal intensity and the plants should not be allowed to grow beyond the plastic (shoots emerging beyond the edges of the covering will provide food to covered rhizomes). However, this method was found to have little success by Apfelbaum and Sams (1987), who observed plants persisting even after 2 years under cover. Non-target species, including native species, also would be controlled with these methods.

4.3.6 Tillage

Tillage by itself is not recommended as it could spread these species, especially the rhizomatous reed canarygrass. Tillage for restoration plantings should be preceded by herbicide or solarization treatments that kill this species.

4.3.7 Burning

Burning generally does not kill mature reed canarygrass and Harding grass, and similar to occasional mowing, actually appears to stimulate additional stem production unless the fire burns through the entire reed canarygrass and Harding grass sod layer down to the mineral soil. Drip torches may be used to treat resprouts, but this can be labor-intensive because it will require repeated applications. Burning alone will not likely eradicate populations, and liability and air quality regulations may restrict its use.

4.4 Yellow Starthistle

Yellow starthistle is a native of Eurasia and first was recorded in California in 1869 (DiTomaso et al. 2006). Now common on roadsides, rangeland, hay fields, pastures, and waste areas, it is estimated to infest close to 8 million acres in California. The disturbance created by cultivation, poorly timed mowing, road building and maintenance, and grazing favors this rapid colonizer. Yellow starthistle forms dense infestations and may produce allelochemicals that prevent growth of competing species, allowing starthistle to take over large areas of land.

Yellow starthistle is a gray-green to blue-green annual plant with a vigorous taproot. It produces bright, dandelion-like yellow flowers with sharp spines surrounding the base. Yellow starthistle grows to varying heights from 6 inches to 3 feet. The stems of mature plants are rigid, spreading and branching from the base. Stems and leaves are covered with a loose, cottony wool that gives them a whitish appearance. Basal leaves are 2 to 3 inches long and deeply lobed. Upper leaves are short, 0.5 to 1 inch, narrow, and sharply pointed. The plant develops a deep taproot, allowing it to proliferate on dry sites or in dry years. The deep taproot extends below the zone of root competition of associated annual species and allows growth and flowering to occur well into the summer, long after other annual species have died and dried up. Yellow starthistle is able to regrow after top removal from mowing or grazing. Seed output can be as high as 29,000 seeds per square meter with about 95% of the seeds being viable. Most seeds germinate the following year, but some seeds can last 10 years or more in soil.

4.4.1 Grazing

Targeted grazing, when performed successfully, will reduce the population of yellow starthistle, minimize damage to desirable species, and support a more integrated approach to weed management. Cattle, sheep, and goats all have been successful in controlling yellow starthistle. Choosing which species to use will depend on the stage of the yellow starthistle. Intensive grazing in late May and June using high densities of cattle, sheep, or goats for a short duration can reduce plant height, canopy size, and seed production. However, overgrazing should be avoided by leaving half the grass by weight. Grazing more than this will reduce the grass recovery rate and ability to shade out yellow starthistle. Grazing can enhance other control methods for yellow starthistle such as herbicide applications.

4.4.2 Chemical Control

Quite a bit is now known about chemical control of yellow starthistle. The five most commonly used herbicides used to control yellow starthistle in Mendocino County are:

- 2,4-D (trade names include: Weedar®, Weedone®, and many others)
- Aminopyralid (Milestone®)
- Clopyralid (Transline®)
- Glyphosate (Roundup® and others)
- Triclopyr (Garlon®, Remedy®)

Of these five herbicides, 2,4-D is a restricted-use herbicide and must be applied by a licensed applicator, but it is also the least expensive option. 2,4-D and triclopyr control all broadleaf species, so native forbs may be damaged. Both herbicides are for post-emergence vegetation, with little soil residual, and perform best when yellow starthistle is between seedling and bolting stages. Clopyralid and aminopyralid are effective both pre- and post-emergence and can be applied in the fall, winter and spring. Both clopyralid and aminopyralid are slightly selective in broadleaf species but some stunting may occur on legumes. In a complete eradication program for horse pastures or horse hay fields (yellow starthistle is toxic to horses but not ruminants), using either clopyralid or aminopyralid in Year 1 and then 2,4-D in Years 2 and 3 is preferred to prevent resistance. As mentioned before, glyphosate is a non-selective, contact herbicide and should be used when annual grasses and legumes are dormant or when yellow starthistle is a pure stand. If the latter is the case, glyphosate works best on yellow starthistle from seedling to early flowering. In the former case, the yellow starthistle is usually mature and repeated treatments every 2 weeks may be necessary. With all herbicidal or mechanical methods of control, it is very

important to plant or seed the areas with desirable species that will compete with yellow starthistle for sun and nutrients.

The quantity of herbicides can be reduced if the mature or tall vegetative growth is cut and cleared and herbicides are applied to the new vegetative growth. A nonionic surfactant should be used to increase effectiveness of most herbicides.

4.4.3 Mechanical Methods

Isolated plants or small patches of yellow starthistle can be removed successfully by digging out and removing all the aboveground stem material. The best time for hand removal is after yellow starthistle has bolted but before it produces viable seed (early flowering).

Tillage using plows or discs where terrain allows is effective in controlling yellow starthistle if done in early summer prior to production of viable seeds. Desirable species also will be affected, and reseeding will need to be postponed until the fall unless there is irrigation available.

4.4.4 Mowing/Cutting

Success with mowing depends on proper timing and the growth form of yellow starthistle. Mowing is most effective at the spiny to early flower stage. In Mendocino County this usually occurs from late April to late May. Mowing too early, before the spiny season, will allow yellow starthistle to recover and suppresses competition from desirable species. Mowing works well when yellow starthistle is found in competing vegetation (grasses) as yellow starthistle's growth form is tall and less branched. In this form mowing may control up to 90% of the yellow starthistle. In pure stands of yellow starthistle, where the growth form is shorter, mowing may not be effective.

4.4.5 Burning

Two or more years of burning will control yellow starthistle but may not be practical because of liability and air quality regulations. A single burning actually may increase yellow starthistle through the suppression of competition and release of nutrients. Similar to mowing, burning should be done in early to midsummer when yellow starthistle has not set viable seed (early flowering). Burning also may be effective in combination with herbicide applications.

4.5 Medusahead

Medusahead is an aggressive winter annual that is a member of the grass family *Poaceae* (USDI Bureau of Land Management 2009). It grows to a height of 0.5 to 2 feet. The leaf blades are generally 1/8-inch wide or less and rolled. Its inflorescence is a long-awned spike nearly as wide as it is long. Mature awns or beards are twisted and are 1 to 4 inches long, stiff, and finely barbed. Sometimes medusahead is confused with foxtail or native squirrel tail; however, the spike head does not break apart as seeds mature. Individual awn-florets fall away, leaving a bristly head of awn-like glumes that persist over winter.

Medusahead is native to Eurasia and is extremely competitive, often crowding out many native and desirable plants and invading millions of acres of rangeland. It appears more commonly on high shrink-swell clay soils. Infested rangelands have suffered up to 75% reductions in grazing capacity. Left unchecked, it forms almost a monoculture and may be responsible for introducing fire into non-fire-prone ecosystems. Control of small, isolated infestations is critical to keep it from becoming widespread. As medusahead is an annual grass, like reed canarygrass and Harding grass, it will be difficult to control without damage to more desirable species.

4.5.1 Grazing

Grazing medusahead closely just before the flower emerges in the spring is a proven method to control this species. However the annual grazing window for this method is only 1–2 weeks. Therefore, this method requires some planning and monitoring of medusahead as the time window approaches. This method may not be practical over large and scattered populations because livestock may graze on other species or may not be able to graze all individual plants prior to seed set. Placement of protein supplements (e.g., Crystalyx) near medusahead patches will increase grazing and trampling in the patch.

4.5.2 Chemical Control

Herbicidal control is limited to glyphosate at the rates mentioned above for reed canarygrass and Harding grass. Herbicides should be applied in the spring (usually May) when medusahead is green and the surrounding vegetation is dry.

4.5.3 Mechanical Methods

As with grazing, mowing before flower emergence is also effective. Tillage of large infestations at this time is another option but may not be desirable because of the elimination of preferred vegetation and the potential to provide suitable seeding areas for nonnative species.

4.5.4 Burning

Prescribed burning in the spring (usually May) when medusahead is green and surrounding vegetation is dry is a proven method of reducing medusahead. However, air quality and fire hazard regulations may preclude use of this method of control.

Chapter 5 Management Unit Objectives and Grazing Practices

Caltrans has acquired more than 30 parcels for offsite mitigation of the Willits Bypass project, of which a select number of parcels or portions of parcels will be available for grazing. The remaining parcels or portions of parcels will not be grazed. For an illustration of the layout of grazed versus ungrazed land, refer to Figures 5-1 through 5-7. In order to facilitate a grazing management system that will benefit mitigation parcel natural resources, it is recommended that the parcels be combined into seven grazing management units (Figure 1-3). The management units developed for the GMP are described in this chapter and summarized in Table 5-1. Management units do not include riparian-mitigation areas that are not grazed.

The majority of land is combined into three management units: West Management Unit (WMU), Middle Management Unit (MMU), and East Management Unit (EMU). Fencing will be installed to further separate the grazed from ungrazed lands within each management unit so that accidental grazing of the ungrazed lands will be avoided. The fenced riparian corridors provide most of the east and west boundaries for the management units. The remaining parcels have been combined into the SMU, NMU, OWMU and North Coast Semaphore Grass Management Unit (NCSGMU).

The SMU is composed of the Arkelian, Goss, MGC Plasma North, and MGC Plasma Middle parcels (Table 2-1). The NMU is composed of the eastern Watson Parcel. The OWMU is composed of two Taylor parcels. The NCGSMU is located on a portion of the Huffman parcel alignment. While current lease agreements are based on the historical parcel designations, for ease of accounting and management, it is recommended that Caltrans gradually transition to lease agreements based on these proposed management unit boundaries.

5.1 West Management Unit

The WMU includes nine pastures formed from all or part of six mitigation parcels on the west side of the valley (Figure 5-1). The WMU is bounded on the east by the Outlet Creek riparian corridor and on the west by an existing segment of US 101 and the future bypass alignment. This WMU includes the riparian corridors along Old Outlet Creek, Mill Creek, Upp Creek, and Wild Oat Canyon Creek. An abandoned railroad bed transects this management unit from northwest to southeast.

Table 5-1. Individual Pasture Acreage, by Management Unit

Management Unit	Pasture Number	Pasture Acreage
West Management Unit	W-1	11.38
	W-2	11.01
	W-3	43.01
	W-4	31.55
	W-5	39.26
	W-6	28.08
	W-7	12.95
	W-8	7.81
	W-9	17.00
	Total	**202.03**
Middle Management Unit	M-1	65.81
	M-2	31.25
	M-3	24.55
	M-4	16.23
	M-5	15.99
	M-6	12.11
	M-7	14.08
	M-8	22.95
	M-9	30.21
	M-10	26.71
	M-11	14.74
	M-12	19.29
	Total	**293.93**
East Management Unit	E-1	38.30
	E-2	24.96
	E-3	64.71
	E-4	15.88
East Management Unit (Continued)	E-5	18.88
	E-6	45.12
	E-7	15.70
	E-8	22.79
	E-9	22.13
	Total	**268.48**
South Management Unit	S-1	9.90
	S-2	12.94
	S-3	9.00
	S-4	21.22
	Total	**53.06**
North Management Unit	N-1	43.42
	N-2	16.74
	Total	**53.06**
Semaphore Grass Management Unit	SG-1	3.28
	Total	**3.28**
Oak Woodland Management Unit	OW-1	149.70
	Total	**149.70**
Total Acres of Grazed Pasture		**1,030.66**

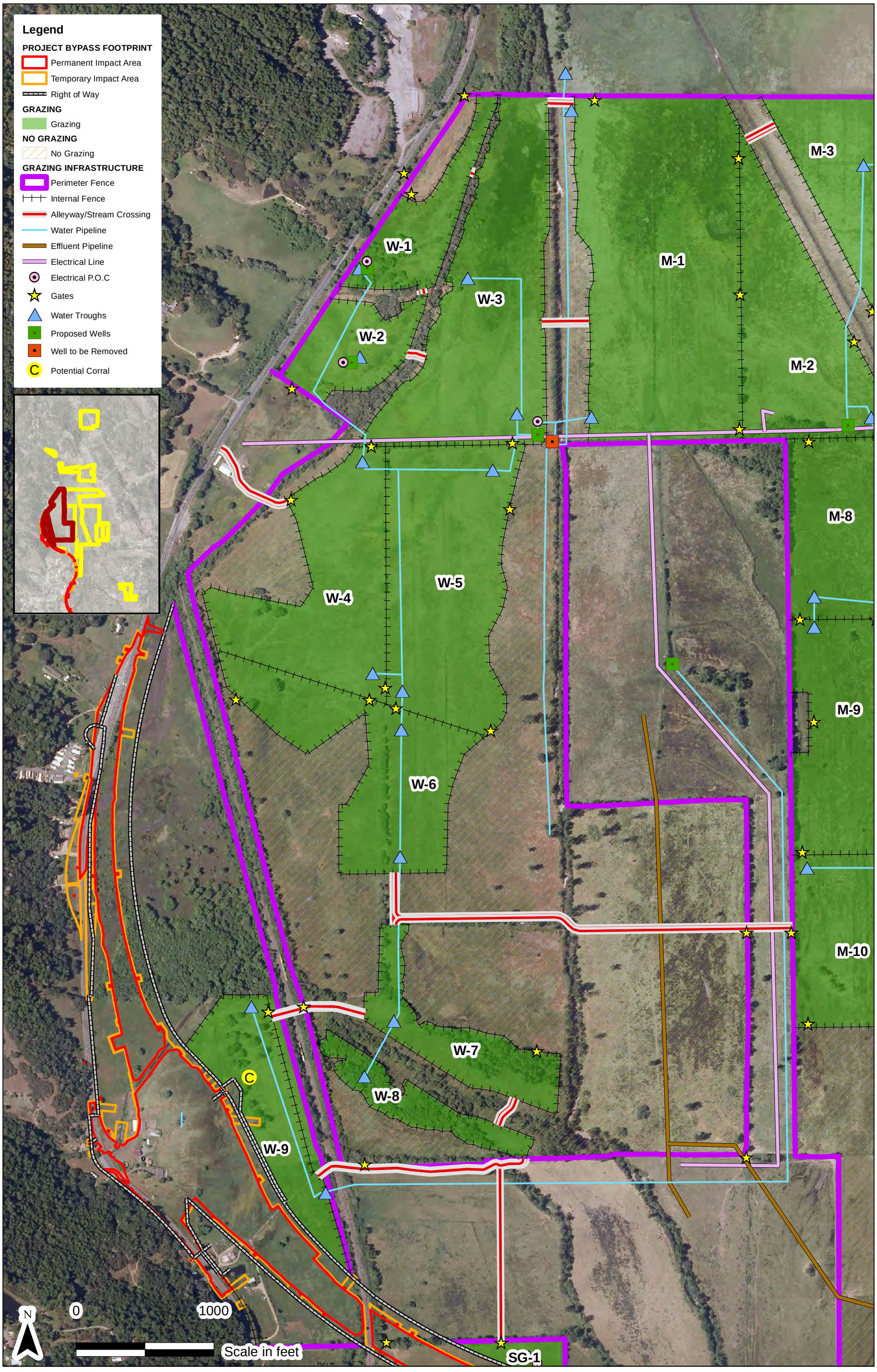

Figure 5-1
Recommended Pasture and Grazing Infrastructure Locations for the West Management Unit

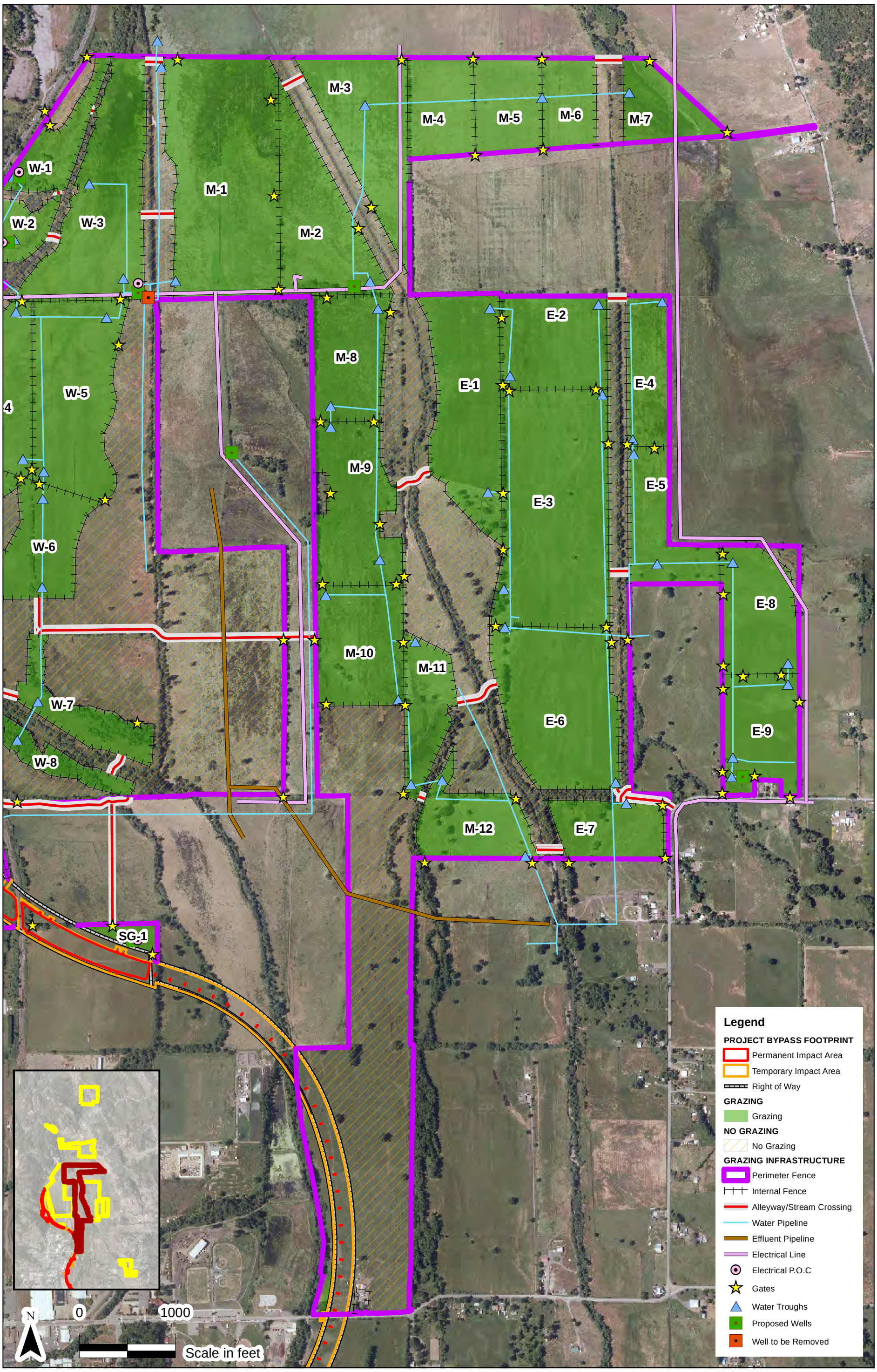

Figure 5-2
Recommended Pasture and Grazing Infrastructure Locations for the Middle Management Unit

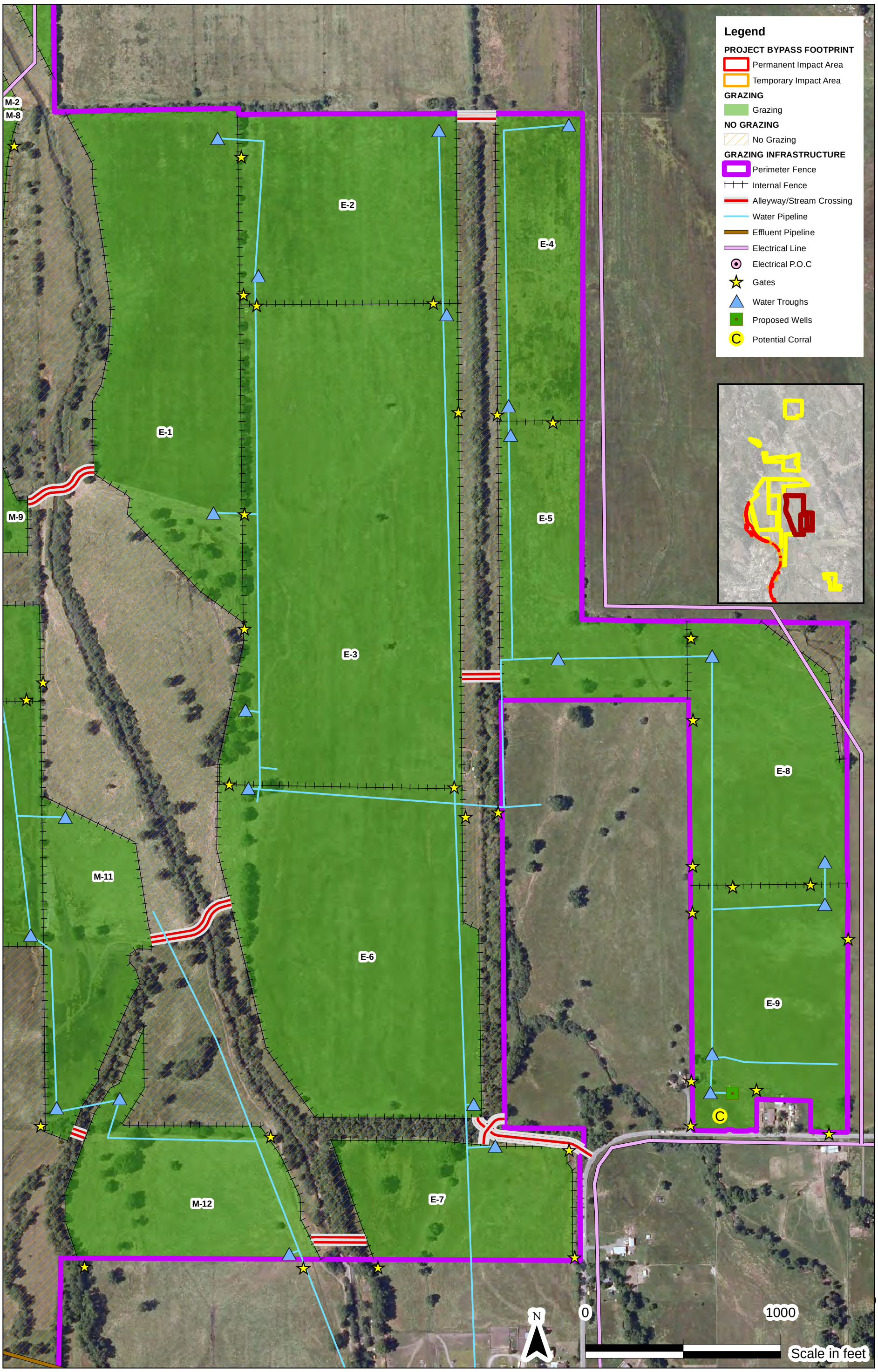

Figure 5-3
Recommended Pasture and Grazing Infrastructure Locations for the East Management Unit

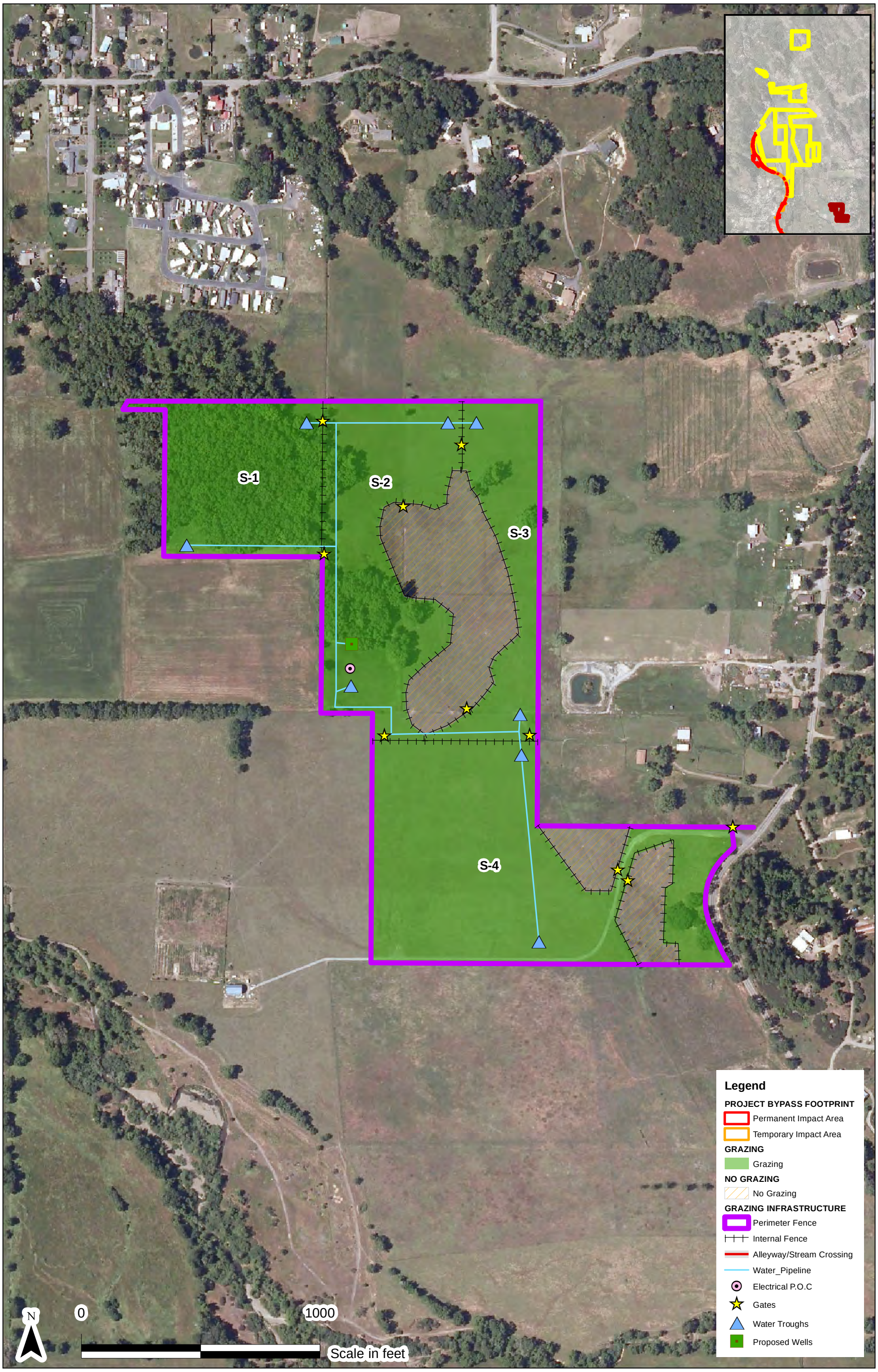

Figure 5-4
Recommended Pasture and Grazing Infrastructure Locations for the South Management Unit

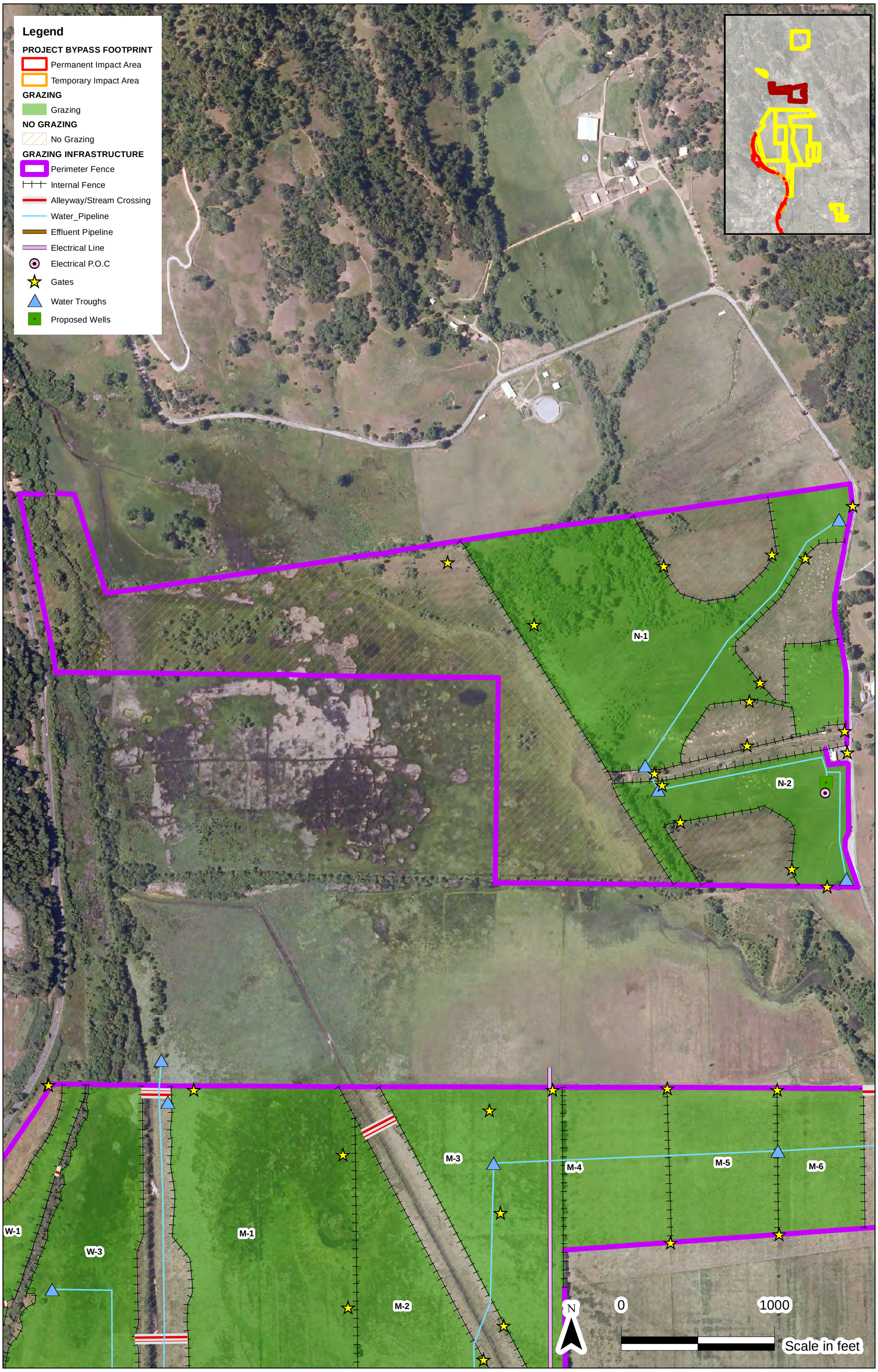

Figure 5-5
Recommended Pasture and Grazing Infrastructure Locations for the North Management Unit

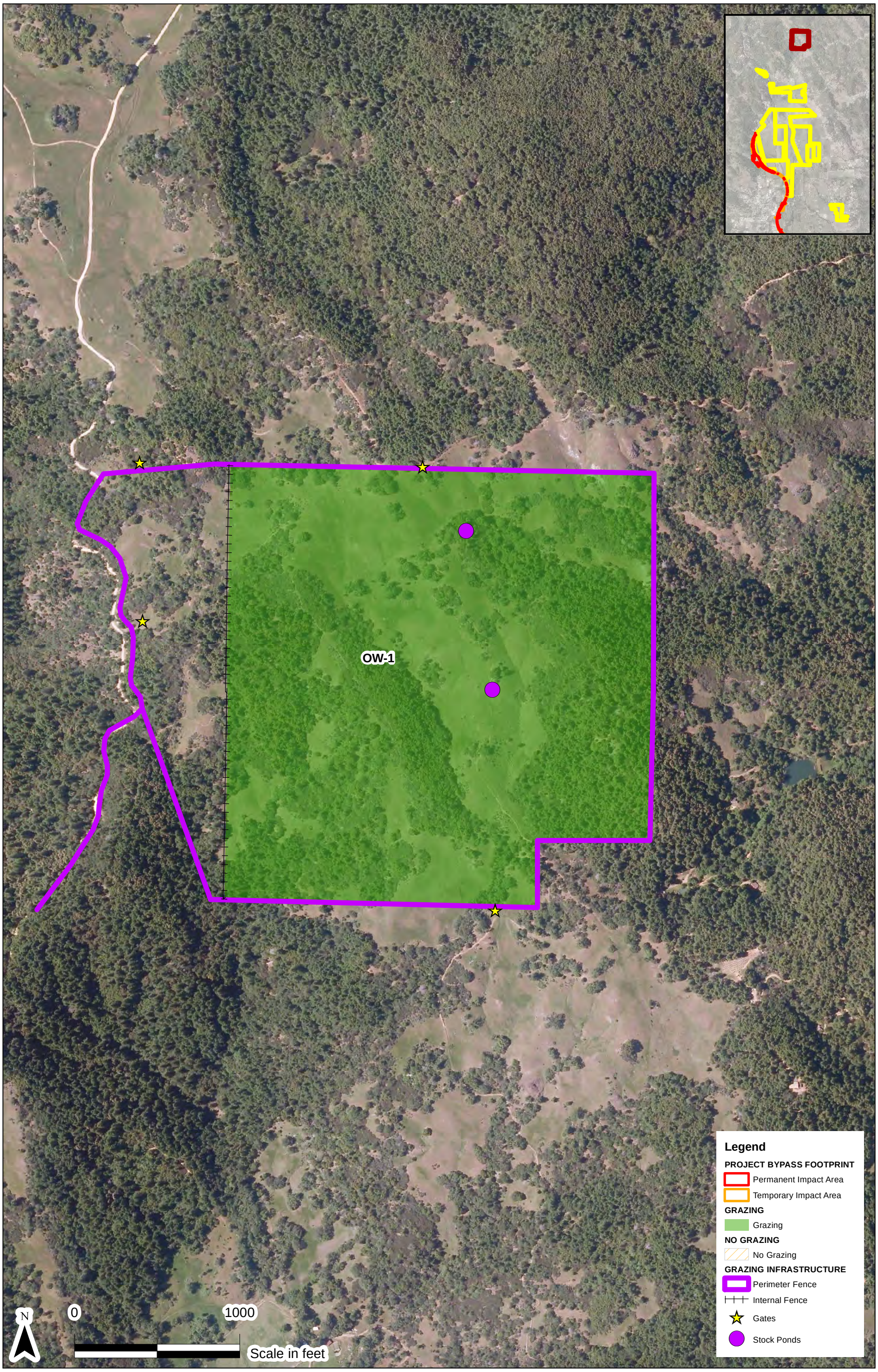

Figure 5-6
Recommended Pasture and Grazing Infrastructure Locations for the Oak Woodland Management Unit

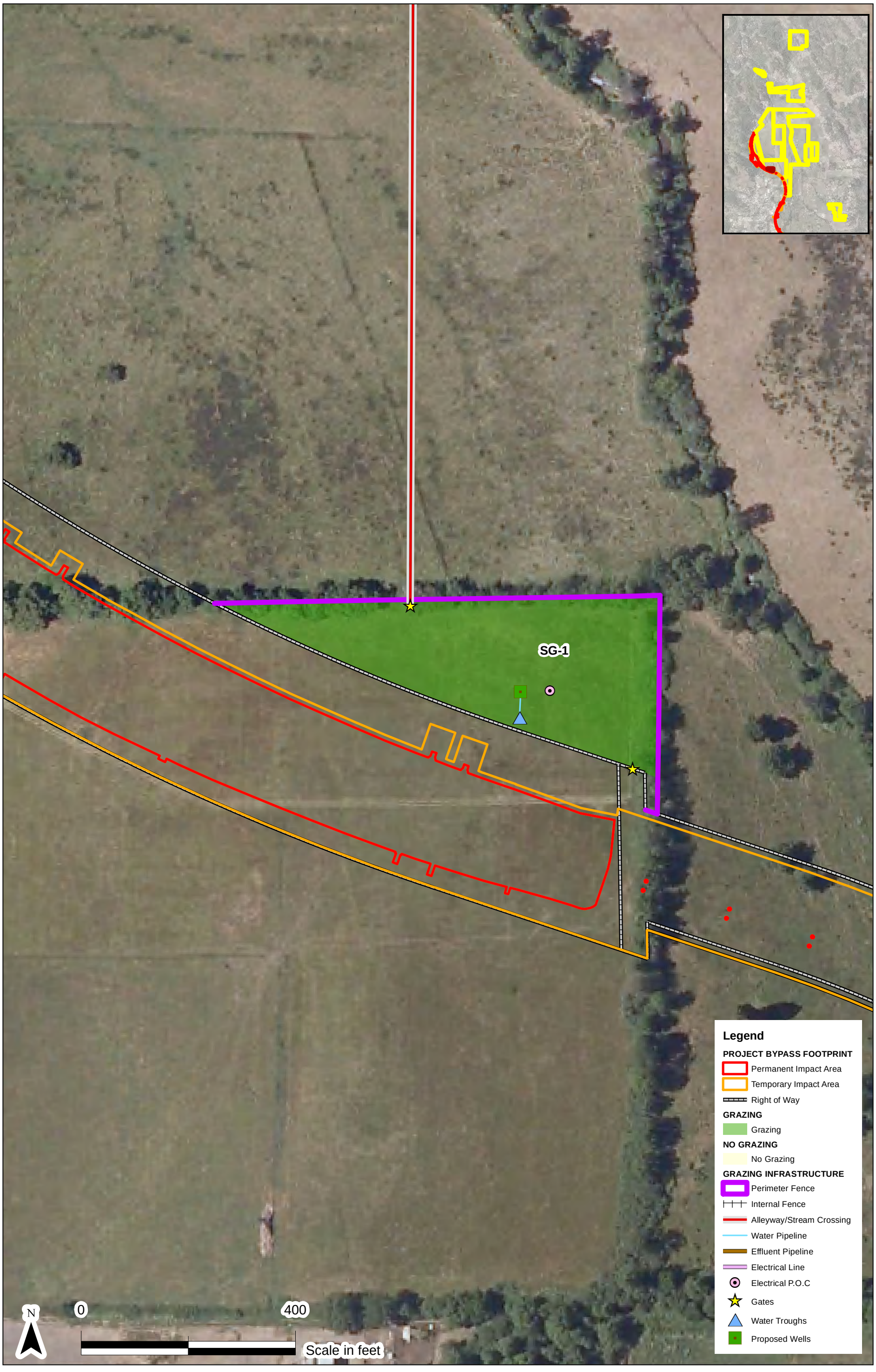

Figure 5-7
Recommended Pasture and Grazing Infrastructure Locations for the North Coast Semaphore Grass Management Unit

5.1.1 Past and Present Grazing Practices

The parcels in this unit are dominated by wet meadow vegetation. Drier upland soils supporting annual grasses and forbs occur along the west edge of this management unit (W-1 and W-2). Most of the WMU is grazed with beef cattle using seasonal rotational grazing. Grazing and hay production have been the historical use of these parcels. The Brooke parcels are not included in this management unit because grazing was removed from these parcels several years ago and, through successional development, they have become dominated by woody vegetation and, in some cases, teasel. The estimated herbaceous production for the seasonal wet meadows in June 2011 ranged from 6,500 to 8,000 lb/acre (Table 2-1). Most of these parcels are part of a rotational grazing system that has stocking rates of 4.5 to 6.5 AUMs/acre/year, depending on annual productivity.

5.1.2 Mitigation Actions

The mitigation actions in the WMU are wetland establishment, wetland rehabilitation (no grazing; planting and seeding), wetland rehabilitation (grazing only), riparian establishment (no grazing), and other waters (riparian corridor) rehabilitation (no grazing). The mitigation actions that preclude grazing have been excluded from the grazed areas in the WMU by exclusion fencing as shown in Figure 5-1.

5.1.3 Performance Standards

The mitigation performance standards, as they relate to grazing practices, are maintaining and improving wetland plant species cover and composition and maintaining and improving NCSG and BM habitat. The grazing-related performance standards associated with the mitigation actions that will occur in this management unit are identified in Chapter 9 of the State MMP.

5.1.4 Grazing Management Recommendations

5.1.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-1. The recommended grazing infrastructure is shown in Figure 5-1. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The WMU contains populations of both BM and NCSG. When possible, water troughs and other infrastructure should be field located to avoid populations of these plants.

FENCES AND GATES

- Some of the fences in this management unit are relatively new and in good condition, while others are old and need to be replaced. Caltrans proposes to replace all perimeter fences and to fence all riparian corridors and areas designated for wetland establishment or rehabilitation covered by the MMPs (Figure 5-1).
- Replace perimeter fences along the highway right-of-way.
- Fence the Outlet Creek, Old Outlet Creek, and Mill Creek riparian corridors, including adjacent wetland establishment and rehabilitation areas.
- Fence the wetland establishment area in the northwest corner of pasture W-1.
- Fence the riparian corridor and all ungrazed mitigation areas along the east side of the WMU.
- Fences along the railroad right-of-way may be unnecessary because woody vegetation, including Himalayan blackberry, already acts as a barrier to livestock.
- Install cross-fences to subdivide the existing pasture on Ford 108-020-04 to create pastures W-4, W-5, and W-6 (Figure 5-1).
- Pastures W-7 and W-8 could be combined by not fencing the riparian corridor that separates W-7 from W-8. According to local information, this stream channel was human-made and rarely flows. During the May–October grazing season, it is dry and not vulnerable to streambank damage by livestock. If this corridor were left unfenced, a hardened crossing between W-7 and W-8 would be unnecessary.
- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option, as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.

- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and is typically the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Install an access gate from US 101 to pasture W-1 at the gate across from the mill site.
- Gates should be installed at the locations shown in Figure 5-1. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment, including hay-making equipment.

Alleyways and Stream Crossings

- Stream crossings, like gates, should be placed and built so that they facilitate herd movement.
- Install riparian corridor (stream) crossings between pastures W-1 and W-2, W-2 and W-3, and two crossings between M1 and W-3, as designated on Figure 5-1. These hardened crossings will facilitate access between pastures. Location of the crossing should be discussed with the grazing lessee.
- Install an alleyway from the Ford Ranch barns to pasture W-4. Harden the existing stream crossing.
- Install an alleyway between W-7 and W-8.
- Install an alleyway from the gate in pasture W-9 to the south end of pasture W-8. This alleyway crosses the railroad tracks. SG-1 could be accessed from this alleyway between W-8 and W-9 with a north-south alleyway if feasible.
- For the existing rotational grazing system to be effective and responsive to differences in pasture soil moisture, access is needed from pastures M10 and M11, across an ungrazed USACE 404 mitigation unit (Ford APN 108-030-05) and Cox 80, and non-Caltrans pasture leases to pasture W-4. This is crucial early in the season, when the northern pastures are too wet to access. The livestock movement will cross from pasture M-10, through the City of Willits field, into Cox 80, and then to pasture W-6. A city easement and protection of new plantings in the mitigation area may be required. This recommendation also is stated in Section 5.2.4.1.

Access and Right-of-Way

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the

flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.

- Right-of-way agreements should be established between Caltrans and adjacent landowners to provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels.

CORRALS AND STAGING AREAS

- Identify existing corrals and staging areas on the Caltrans-owned parcels. If there are no existing corrals or staging areas, it is recommended that new areas be identified and budgeted for construction.

WATER SOURCE AND WATER TROUGHS

- Pastures W-1, W-2, and W-7 will need water troughs and additional water developments, depending on the source of water for these troughs. Figure 5-1 indicates the need for a well in W-1 and in W-2. Approximate recommended locations for the water troughs are shown in Figure 5-1.
- Install water developments, including a pipeline to provide stock water, in W-3, W-4, W-5, W-6, W-7, and W-8 (Figure 5-1).
- Add a water trough in W-9. Existing and new troughs can be serviced by extending the east-west pipeline just south of W-8 (Figure 5-1).
- Water troughs should be located away from areas of concentrated BM unless additional beneficial grazing impacts are needed to maintain or improve BM patches and patch borders.
- Some existing water lines lie within the proposed USACE 404 mitigation lands. Lessees need access and continuing permits to enter ungrazed mitigation areas to maintain infrastructure (pipelines, fences, electrical, etc.) and repair damage immediately.

SHADED AREAS

- Some of the new pasture configurations do not allow for adequate shade for cattle herds in all pastures. Until mitigation boundary fences are in place, it is unclear how much shade will be provided by existing trees. Adequate shade (30 to 40 square feet [sq. ft.] per cow) should be provided following the USDA NRCS guidelines.

5.1.4.2 GRAZING PRESCRIPTION

The grazing prescription for the WMU is summarized in Table 5-2.

Table 5-2. Grazing Prescription for the West Management Unit

Action	Description of Grazing Prescription
Location of grazing	The entire management unit will be grazed except for the riparian corridor, wetland establishment, and wetland rehabilitation where agriculture management is prohibited (e.g., ungrazed wetland rehabilitation). These areas will be fenced to exclude grazing.
Stocking rate	4.5 AUMs/acre/year to 6.5 AUMs/acre/year depending on the actual length of the grazing season.
RDM target	1,200 to 1,500 lb/acre.
Season of grazing	May 1 through October.
Frequency and duration of grazing	This management unit is cross-fenced to facilitate rotational grazing that will support NCSG and BM (Appendices B and C). The precise sequence of pasture use is determined by the grazing manager. The length of the rest period will range from 30 to 60 days depending on plant growth rates as influenced by current soil moisture and climatic conditions. Graze periods are usually a few to 10 days depending on the size of the pasture and the length of the rest period.
Hay harvest	This parcel could be harvested for hay in the spring or summer and grazed to meet the RDM target.
Kind and class of animal	Beef cows and calves are best choice for 1,200 to 1,500 lb RDM targets. Sheep are an acceptable alternative, but they must be managed closely to meet the RDM target. Sheep and goats may be used for weed control.
Grazing guidelines	Management for BM should follow the guidelines in Appendix B. Management of NCSG should follow the guidelines in Appendix C.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow lessees to feed hay.

5.1.4.3 INVASIVE SPECIES MANAGEMENT PRACTICES

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry occurs along fence lines, and control may be required to remove and replace fences and gates. The MMP does not require blackberry control in the riparian corridors; therefore, if it is determined that fences in this management unit do not need replacement; blackberry control measures will not be implemented.

Reed canarygrass and Harding grass are present in this management unit and could be controlled using chemical spot treatments. Teasel infestations should be controlled following the methods described Chapter 4. Extensive teasel infestations have developed in the Brooke parcels where successional development has progressed for several years. Smaller teasel infestations are present in the Niesen parcel. Yellow starthistle occurs in the drier portions along the west side of this management unit (W-1 and W-2). Medusahead was not observed in this management unit. It could invade the drier western portions of this management unit in the future.

5.1.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily and to ensure that NCSG and BM areas are receiving adequate grazing to reduce competition from other plant species. Photo-guides should be used to estimate RDM. Large areas that appear to be below the target can be sampled by clipping a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season. Smaller areas of low RDM will occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Density and cover of NCSG and BM populations should be monitored before and after targeted grazing to determine whether grazing practices are achieving desired results. Invasive species should be monitored to detect extent and spread over time to control effectiveness. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.1.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

5.1.6.1 GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.

5.1.6.2 LIVESTOCK ACCESS AND MOVEMENT

- According to local information, the riparian corridor that splits pastures W-7 from W-8 was human-made and rarely flows. The channel associated with this corridor is dry during the May–October grazing season. If this corridor were left unfenced, a hardened crossing would be unnecessary and the two pastures (W-7 and W-8) could be combined.
- There are potential access issues to pastures W-7, W-8, and W-9. Present access is from the current US 101. It appears that the new highway will not provide access to these pastures; therefore, they will need to be accessed through pasture W-6 or via an easement across property between W-8 and S-G1.

- There is a potential future issue with access between pastures W-6 and W-7. While access may not be needed currently because these two pastures have different lessees, in the future it may be necessary to move livestock from the south end of pasture W-6 across the wetland rehabilitation area into pastures W-7 and W-8. Currently, gates and an alleyway are proposed to facilitate movement from pasture WW-7 to W-8.
- Gates and stream crossings should be placed and built so that they facilitate herd movement.
- Herding of livestock across ungrazed mitigation units will be necessary to maintain the integrity of the rotational grazing system that is fundamental to achieving NCSG and BM goals for the WMU, MMU, and EMU.

5.1.6.3 ALLEYWAYS AND STREAM CROSSINGS

- If fences were installed across stream channels to create defined alleyways, it is likely the fences would fail during high flow. Therefore, permanently fenced crossings are not recommended.
- Stream crossings will be used only when livestock are moved by herders from one pasture to another or when vehicles and equipment cross. Moving in a herd and managed by a herder, cattle will not stray above or below the crossing. Gates to stream crossings will remain closed when not in use.

5.1.6.4 SPECIAL STATUS PLANT–SPECIES MANAGEMENT

- Little is known about the habitat needs of NCSG and BM. Consequently, assumptions about their potential for expansion are not substantiated by science. Likewise, the grazing prescriptions for these species are not based on a good foundation of science. The response of these species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum, the potential extent of expansion of both species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.
- Currently the lack of fencing along riparian corridors and reduced RDM adjacent to stream channels allows unimpeded overland flow and movement of debris out of and away from the stream channels. This allows periodic sediment deposition in BM patches, which may be important to maintaining BM populations. It has been observed by valley residents that BM populations decrease after overland sediment deposition is reduced by changes in land management practices.

5.1.6.5 SHADED AREAS

- Fencing of the riparian corridor between pastures M-1 and W-3 will result in no shade for livestock in these two pastures. Shade is an animal welfare issue.

5.2 Middle Management Unit

MMU occurs on 10 mitigation parcels (Figure 5-2). The MMU is bounded on the northwest by Outlet Creek and on the west by parcels owned by the City of Willits. The MMU is bounded on the east by the Davis Creek corridor with the exception of the pastures M-3–M-7, which occur on the east side of Davis Creek. The MMU is bounded on the north by privately owned lands and on the south by privately owned land and a portion of a Benbow mitigation parcel that will not be grazed.

5.2.1 Past and Present Grazing Practices

The parcels in this unit are dominated by wet meadow vegetation. Grazing and hay production have been the historical use of these parcels. These parcels currently are grazed with beef cattle using seasonal rotational grazing. The estimated production for these parcels in June 2011 ranged from 6,900 to 8,100 lb/acre (Table 2-1). These parcels are part of a rotational grazing system that has stocking rates of 4.5 to 6.5 AUMs/acre/year, depending on annual productivity.

5.2.2 Mitigation Actions

The mitigation actions in the MMU are wetland establishment, wetland rehabilitation (no grazing; planting and seeding), wetland rehabilitation (grazing only), riparian establishment (no grazing), and other waters (riparian corridor) rehabilitation (no grazing). The mitigation actions that preclude grazing have been excluded from the grazed areas in the MMU by exclusion fencing as shown in Figure 5-2.

5.2.3 Performance Standards

The mitigation performance standards, as they relate to grazing practices, are maintaining and improving wetland plant species cover and composition and maintaining and improving BM habitat. The grazing-related performance standards associated with the mitigation actions that will occur in this management unit are identified in Chapter 9 of the State MMP.

5.2.4 Grazing Management Recommendations

5.2.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure in the MMU is shown in Figure 2-2. The recommended grazing infrastructure is shown in Figure 5-2. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The MMU contains populations of BM. When possible, water troughs and other infrastructure should be field located to avoid populations of these plants.

FENCES AND GATES

- Existing fences and gates on this management unit are generally in good condition although some are in need of repair or replacement (Figure 2-2). Caltrans proposes to replace all perimeter fences and to fence all riparian corridors and areas designated for wetland establishment or rehabilitation covered by the MMPs (Figure 5-2).
- The fence between pastures M-3 and M-4 needs to be repaired or upgraded.
- Replace perimeter fences around the perimeter of the MMU.
- Fence the Davis Creek riparian corridor and an unnamed tributary corridor, including adjacent wetland and other waters rehabilitation areas that will not be grazed.
- Fence the wetland establishment areas.
- Fence the riparian corridor between M-2 and M-3.
- Properly align proposed fences along property lines east of M-3. There is a recorded survey of the fence line east of M-3 that shows the corners marked on the survey. The fence line along the north side of the Wildlands parcels south of Cox 80 should form a straight line. John Ford has survey records showing east-west parcel boundaries different from those in Caltrans maps.
- Install cross-fences, as needed, to form pastures M-1 through M-12 as indicated in Figure 5-2. Cross-fencing should be reviewed with the lessee and adjusted as needed. This cross-fencing arrangement will result in pastures where stock density can be manipulated more easily to manage BM populations.

- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.
- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and typically is the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Gates should be installed at the locations shown in Figure 5-2. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment, including hay-making equipment.

Alleyways and Stream Crossings

- Stream crossings, like gates, should be placed and built so that they facilitate herd movement.
- Install riparian corridor (stream) crossings between pastures M-2 and M-3, E-1 and M-9, E-6 and M-11, E-7 and M-11, and M11 and M-12 as designated on Figure 5-2. These hardened crossings will facilitate access between management units. Exact location of the crossing should be discussed with the grazing lessee.

Access and Right-of-Way

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.
- Right-of-way agreements should be established between Caltrans and adjacent landowners to provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels.
- For the existing rotational grazing system to be effective and responsive to differences in pasture soil moisture, the following access points are recommended.
    - Access is needed from pastures M-10, M-11 and M-12, across ungrazed mitigation units and non-Caltrans pasture leases to pasture W-6.

  - To prevent the mixing of herds in the pastures along Davis Creek with cattle being moved between M-2, M-12 and other pastures, access is needed from M2 along the existing farm road to pastures M-11 and M12. The farm road currently exists and would be located in the proposed Davis Creek riparian and mitigation corridor.

- The three southern Benbow parcels are proposed as ungrazed mitigation units. This closes access to pasture M-10 from the Benbow corrals on Hearst Road. Lessees need to be able to herd livestock across these ungrazed mitigation units to reach pasture M-10. Some alternatives for moving cattle from Hearst Road to M-10 are (1) herd cattle across the three ungrazed mitigation parcels, (2) seek easements along City-owned parcels just west of the mitigation parcels, and (3) investigate the possibility of lease trading between the affected lessees that will preclude the need to cross the mitigation parcels.

Corrals and Staging Areas

- At least one new set of corrals is needed. The Benbow house and corrals are the only staging area for livestock grazing currently on the Caltrans-owned parcels. With this staging area effectively cut off from the rest of the grazing lands by the three ungrazed Benbow mitigation parcels, it is recommended that Caltrans identify a new site for corrals and budget their construction. E-9 is one potential location for a new set of corrals.
- Currently there are six water troughs in this management unit (Figure 2-2). Additional water troughs will be required (Figure 5-2).

Water Troughs and Water Source

- Water troughs should be located away from areas of concentrated BM unless additional beneficial grazing impacts are needed to maintain or improve BM patches and patch borders.
- With additional pipeline, the pump in the southern part of M-2 can furnish water to M-2–M-7 and M-8 M-12. Currently the water source for many of these pastures originates on the Ford Ranch.

Shaded Areas

- Some of the new pasture configurations do not provide adequate shade for cattle herds in all pastures. Until mitigation boundary fences are in place, it is unclear how much shade will be provided by existing trees. Adequate shade (30 to 40 sq. ft. per cow) should be provided following the USDA NRCS guidelines.

5.2.4.2 GRAZING PRESCRIPTION

The grazing prescription for the MMU is summarized in Table 5-3.

Table 5-3. Grazing Prescription for the Middle Management Unit

Action	Description of Grazing Prescription
Location of grazing	Grazing will be located in pastures M-1–M-12. Grazing will be excluded from the riparian corridors and adjacent mitigation action areas (Figure 5-2). The wetland establishment areas will be protected from grazing.
Stocking rate	4.5 AUMs/acre/yr to 6.5 AUMs/acre/yr depending on the actual length of the grazing season.
RDM target	1,200 to 1,500 lb/acre.
Season of grazing	May 1 through October.
Frequency and duration of grazing	This management unit is cross-fenced to facilitate rotational grazing that will support BM (Appendix B). The precise sequence of pasture use is determined by the grazing manager. The length of the rest period will range from 30 to 60 days depending on plant growth rates as influenced by soil moisture and climatic conditions. Graze periods are usually a few to 10 days depending on the size of the pasture and the length of the rest period.
Hay harvest	Portions of this management unit may be harvested for hay and grazed to meet the RDM target.
Kind and class of animal	Beef cows and calves are the best choice for the RDM target of 1,200 to 1,500 lb. Sheep are an acceptable alternative, but they must be managed closely to meet the RDM target. Sheep or goats may be used for weed control after BM seed set.
Grazing guidelines	Pastures M-1–M-6 have extensive patches of BM. Management for BM should follow the guidelines in Appendix B.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow lessees to feed hay.

5.2.4.3 INVASIVE SPECIES MANAGEMENT

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry occurs along fence lines, and control may be required to remove and replace fences and gates. The MMP does not require blackberry control in the riparian corridors; therefore, if it is determined that fences in this management unit do not need replacement, blackberry control measures will not be implemented.

Reed canarygrass and Harding grass are present in this management unit and could be controlled using chemical spot treatments. Teasel should be controlled as it occurs. Medusahead and yellow starthistle were not observed in this management unit and would not be expected to colonize because the majority of the management unit is wet meadow.

5.2.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily and to ensure that BM areas are receiving adequate grazing to reduce competition from other plant species. Photo-guides should be used to estimate RDM. RDM can be quantified for large areas that appear to be below the target. Clipping of a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season should be adequate to quantify RDM levels. Smaller areas of low RDM will occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Density and cover of BM populations should be monitored following targeted grazing to determine whether grazing practices are achieving desired results. Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.2.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

5.2.6.1 GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The potential for debris dams and flooding should be considered and evaluated before implementation of the mitigation project. The design and location of fencing and other stream corridor infrastructure need to be fully reviewed during the design phase of the mitigation project.

5.2.6.2 FENCES AND GATES

- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.

- Fences across stream channels could create debris dams and fail during high flow and should not be installed. Overland flow resulting from debris dams could carry fish from the stream into adjacent fields.
- Stream crossings will be used only when livestock are moved by herders from one pasture to another or when vehicles and equipment cross. Moving in a herd and managed by a herder, cattle will not stray above or below the crossing. Gates to stream crossings will remain closed when not in use.

5.2.6.1 LIVESTOCK ACCESS AND MOVEMENT

- The majority of the Benbow properties no longer will be open to grazing. Pastures M-8–M-10 will be the only area open to the current lessee of those properties. This remaining area may not meet the needs of the current lessee who grazes the five Benbow parcels.

5.2.6.2 SPECIAL STATUS PLANT–SPECIES MANAGEMENT

- Little is known about the habitat needs of BM. Consequently, assumptions about their potential for expansion are not substantiated by science. Likewise, the grazing prescriptions for this species are not based on a good foundation of science. The response of these species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum the potential extent of expansion of both species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.
- Currently the lack of fencing along riparian corridors and reduced RDM adjacent to stream channels allow unimpeded overland flow and movement of debris out of and away from the stream channels. This provides periodic sediment deposition in BM patches, which may be important to maintaining BM populations. It has been observed by valley residents that BM populations decrease after overland sediment deposition is reduced by changes in land management practices.

5.2.6.3 SHADED AREAS

- Fencing of the riparian corridor may result in inadequate or no shade for livestock. Shade is an animal welfare issue.

5.2.6.4 MANAGEMENT AND MAINTENANCE

- Proposed fences along riparian corridors and mitigation areas could pose maintenance problems during flood events by preventing and altering overland flow and may reduce sediment deposition in BM patches. Entrapped debris could increase flooding that damages mitigation areas and creates health and safety hazards in Little Lake Valley.

5.3 East Management Unit

The EMU includes nine pastures formed from all or portions of six mitigation parcels on the east side of the valley (Table 2-1, Figure 5-3). This unit includes all or portions of four Wildlands parcels and the Frost parcel. The EMU is bounded on the west by Davis Creek and on the north, east, and south by privately owned parcels.

5.3.1 Past and Present Grazing Practices

The EMU is dominated by wet meadows. These parcels historically have been used for cattle grazing and hay production. That use presently continues under current lease agreements. The estimated standing crop in June 2011 ranged from 6,000 to 8,900 lb/acre (Table 2-1). These parcels are currently part of a rotational grazing system that has stocking rates of 4.5 to 6.5 AUMs/ac/year depending on annual productivity.

5.3.2 Mitigation Actions

The mitigation actions in the EMU are wetland establishment, wetland rehabilitation (no grazing; planting and seeding), wetland rehabilitation (grazing only), riparian establishment (no grazing), and other waters (riparian corridor) rehabilitation (no grazing). The mitigation actions that preclude grazing have been excluded from the grazed areas in EMU by exclusion fencing as shown in Figure 5-3.

5.3.3 Performance Standards

The performance standards for the mitigation, as they relate to grazing practices, are maintaining and improving wetland plant species cover and composition and maintaining and improving NCSG and BM habitat. The grazing-related performance standards associated with the mitigation actions that will occur in this management unit are identified in Chapter 9 of the State MMP.

5.3.4 Grazing Management Recommendations

5.3.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-3. The recommended grazing infrastructure is shown in Figure 5-3. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The EMU contains populations of BM and NCSG. When possible, water troughs and other infrastructure should be field located to avoid populations of these plants.

FENCES AND GATES

- The current perimeter fence, cross-fences, and gates for the EMU are in good condition (Figure 2-3). Caltrans proposes to replace all perimeter fences and to fence all riparian corridors and areas designated for wetland establishment or rehabilitation covered by the MMPs (Figure 5-3).
- Fence the management unit perimeter and riparian corridors.
- Fence the east side of the Davis Creek riparian corridor. This corridor also serves as the west boundary of the EMU.
- Install cross-fences to form pastures E1–E-9. This cross-fencing plan should be reviewed with the lessee and adjusted as needed. This cross-fencing arrangement will result in three pastures (E2–E-4) where stock density can be manipulated more easily to manage BM populations. Installation of these cross-fences will form a fenced riparian corridor along Berry Creek. Existing cross-fences that are in good working conditions do not need to be replaced.
- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.
- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and is typically the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Gates should be installed at the locations shown in Figure 5-3. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment, including hay-making equipment.

Alleyways and Stream Crossings

- Stream crossings, like gates, should be placed and built so that they facilitate herd movement
- Install riparian corridor (stream) crossings between E-2 and E-4 at the north end, E-3 and E-5, E-6 and the adjacent non-Caltrans parcel to the east, E-6 and E-7, E-6 and M-11, E-7 and M-12, and E-1 and M-9 as designated on Figure 5-3. The location of the crossings should be discussed with the grazing lessee and adjusted as needed.
- To facilitate rotational grazing onto non-Caltrans parcels, install an alleyway from southwest corner of E-4 to the east into the non-Caltrans parcel between E-4 and E-8 and E-9.
- Install an alleyway from the curve in Hearst Road to pasture E-4.

Access and Right-of-Way

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.
- Right-of-way agreements should be established between Caltrans and adjacent landowners to provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels.

Corrals and Staging Areas

- Identify existing corrals and staging areas on the Caltrans-owned parcels. If there are no existing corrals or staging areas, it is recommended that new areas be identified and budgeted for construction.
- Pasture E-9 is one potential location for a new set of corrals.

Water Troughs and Water Source

- Install new troughs in pastures E1–E5, E-8, and E-9. Some water sources for these troughs originate on land owned by the Ford Ranch.
- Install pipelines to connect existing and new troughs as shown in Figure 5-3. Install wells to service the pipelines.

- Some existing water lines lie within the proposed USACE 404 mitigation lands. Lessees need access and continuing permits so that they can enter ungrazed mitigation areas to maintain infrastructure (pipelines, fences, electrical, etc.) and repair damage immediately.

SHADED AREAS

- Some of the new pasture configurations do not provide adequate shade for cattle herds in all pastures. Until mitigation boundary fences are in place, it is unclear how much shade will be provided by existing trees. Adequate shade (30 to 40 sq. ft. per cow) should be provided following the USDA NRCS guidelines.

5.3.4.2 GRAZING PRESCRIPTION

The grazing prescription for the EMU is summarized in Table 5-4.

5.3.4.3 INVASIVE SPECIES MANAGEMENT

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry occurs along fence lines, and control may be required to remove and replace fences and gates. The MMP does not require blackberry control in the riparian corridors; therefore, if it is determined that fences in this management unit do not need replacement, blackberry control measures will not be implemented.

Teasel, Harding grass, and reed canarygrass were not observed but may be present in the future and could be controlled using chemical spot treatments. Medusahead and yellow starthistle were not observed in this parcel and would not be expected to colonize because the majority of the management unit is wet meadow.

Table 5-4. Grazing Prescription for the East Management Unit

Action	Description of Grazing Prescription
Location of grazing	The entire management unit will be grazed except for the riparian corridor and areas designated for wetland establishment and wetland and riparian rehabilitation. These areas will be fenced to exclude grazing.
Stocking rate	4.5 AUMs/acre/yr to 6.5 AUMs/acre/yr depending on the actual length of the grazing season.
RDM target	1,200 to 1,500 lb /acre.
Season of grazing	May 1 through October.
Frequency and duration of grazing	This management unit is cross-fenced to facilitate rotational grazing that will support BM and NCSG (Appendices B and C). The precise sequence of pasture use is determined by the grazing manager. The length of the rest period will range from 30 to 60 days depending on plant growth rates as influenced by soil moisture and climatic conditions. Graze periods are usually a few to 10 days depending on the size of the pasture and the length of the rest period.
Hay harvest	This parcel could be harvested for hay in the spring or summer and grazed to meet the RDM target.
Kind and class of animal	Beef cows and calves are the best choice for 1,200 to 1,500 lb/acre RDM targets. Sheep are an acceptable alternative, but they must be managed closely to meet the RDM target. Sheep and goats may be used for weed control.
Grazing guidelines	Management for BM should follow the guidelines in Appendix B and management of NCSG should follow the guidelines in Appendix C.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow lessees to feed hay.

5.3.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily and to ensure that NCSG and BM areas are receiving adequate grazing to reduce competition. Photo-guides should be used to estimate RDM. RDM can be quantified for large areas that appear to be below the target. Clipping of a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season should be adequate to quantify RDM levels. Smaller areas of low RDM will occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Density and cover of NCSG and BM populations should be monitored before and after targeted grazing to determine whether grazing practices are achieving desired results. Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.3.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

5.3.6.1 GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.

5.3.6.1 LIVESTOCK ACCESS AND MOVEMENT

- Gates and stream crossings should be placed and built so that they facilitate herd movement.
- Herding of livestock across ungrazed mitigation units may be necessary to maintain the integrity of the rotational grazing system that is fundamental to achieving NCSG and BM goals for the EMU.

5.3.6.2 ALLEYWAYS AND STREAM CROSSINGS

- An alleyway may be needed between E-1 and M8.
- Fences across stream channels may fail during high flow and should not be installed. Stream crossings will be used only when livestock are moved by herders from one pasture to another or when vehicles and equipment cross. Moving in a herd and managed by a herder, cattle will not stray above or below the crossing. Gates to stream crossing will remain closed when not in use.

5.3.6.3 SPECIAL STATUS PLANT–SPECIES MANAGEMENT

- Little is known about the habitat needs of BM and NCSG. Consequently, assumptions about their potential for expansion are not substantiated by science. Likewise, the grazing prescriptions for these species are not based on a good foundation of science. The response of these species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum, the potential extent of expansion of both species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.
- Currently the lack of fencing along riparian corridors and reduced RDM adjacent to stream channels allow unimpeded overland flow and movement of debris out of and away from the stream channels. This provides periodic sediment deposition in BM

patches, which may be important to maintaining BM populations. It has been observed by valley residents that BM populations decrease after overland sediment deposition is reduced by changes in land management practices

5.3.6.4 SHADED AREAS

- Fencing of the riparian corridor between pastures M-1 and W-3 will result in no shade for livestock in these two pastures. Shade is an animal welfare issue.

5.4 South Management Unit

The SMU includes four mitigation parcels (Table 2-1, Figure 5-4). The SMU is not contiguous with any other management unit. There are no riparian corridors associated with this management unit. The SMU is bounded by privately owned parcels with the exception of the east side of the MGC Plasma Middle parcel, which is bounded by Eastside Road.

5.4.1 Past and Present Grazing Practices

Pasture S-1 is relatively undeveloped and is nearly completely covered by a dense canopy of riparian forest (Figure 5-4). It is unclear how much it has been grazed in the past or currently. There are small areas of wet meadow, dominated by grasses and forbs, that could be grazed along the south and west edges and in the northeast corner of this parcel. The productivity of these wet meadow patches was 5,400 lb/acre as measured in June 2011 (Table 2-1).

Pasture S-2 is composed of wet meadow with riparian forest. The wet meadow portions of this parcel and portions of the riparian understory normally are cut for hay (Figure 5-4). Historically 14 to 20 tons of hay have been harvested from this pasture annually, and regrowth was grazed with cattle or sheep. Pasture S-3 also is dominated by seasonal wet meadow. The productivity of the wet meadow ranged from 4600 to 5,700 lb/acre as measured in June 2011 (Table 2-1).

Pasture S-4 is dominated by annual and perennial rangeland plant species. Small areas of wet meadow occur on the east side of this pasture. Past practices are uncertain, but fence arrangements and fence removals suggest that S4 has been grazed and harvested for hay. A gravel road crosses S-4 near the east end, crossing between two wetland patches (Figure 5-4). The productivity of this rangeland pasture was 3,649 lb/acre measured in June 2011 (Table 2-1).

5.4.2 Mitigation Actions

The mitigation actions in the SMU are wetland establishment, wetland rehabilitation (no grazing; planting and seeding), and wetland rehabilitation (grazing only). The mitigation actions that preclude grazing have been excluded from the grazed areas in SMU by exclusion fencing as shown in Figure 5-4.

5.4.3 Performance Standards

The mitigation performance standards, as they relate to grazing practices, are maintaining and improving wetland plant species cover and composition and maintaining and improving BM habitat. The grazing-related performance standards associated with the mitigation actions that will occur in this management unit are identified in Chapter 9 of the State MMP.

5.4.4 Grazing Management Recommendations

5.4.4.1 INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-4. The recommended grazing infrastructure is shown in Figure 5-4. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The SMU contains populations of BM and NCSG. When possible, water troughs and other infrastructure should be field located to avoid populations of these plants.

FENCES AND GATES

- All fences in this parcel need to be replaced or upgraded (Figure 2-4). Caltrans proposes to replace all perimeter fences and to fence all riparian corridors and areas designated for wetland establishment and rehabilitation covered by the MMPs (Figure 5-4).
- There are broken, loose and tangled wires and temporary repairs in the fences around all of the parcels. This material should be removed before implementing the GMP.

- The wetland establishment area in S-2 and S-3 will be permanently fenced. The two wetland rehabilitation areas on either side of the gravel road in the eastern end of -S4 should be fenced separately, leaving space for livestock and vehicles to move along the gravel road between the two wetland rehabilitation patches (Figure 5-4). These also will be permanent fences.
- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and is typically the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.
- Gates should be installed at the locations shown in Figure 5-4. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment, including hay-making equipment.
- Gates will be needed between all four parcels if they are to be managed or leased together.

Alleyways and Stream Crossings

There are no stream crossings in this management unit.

Access and Right-of-Way

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.
- Right-of-way agreements should be established between Caltrans and adjacent landowners to provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels.

CORRALS AND STAGING AREAS

- At least one corral is needed. S-4 is one potential location for a new set of corrals.

WATER TROUGHS AND WATER SOURCE

- There are no water troughs in these pastures. The SMU will need water troughs installed as shown in Figure 5-4. Livestock currently get water from the shallow pond associated with the wetland patch on the south side of pasture S-4. This water source no longer will be available once the wetlands are permanently fenced.
- A well, tank, and pipeline must be developed to service the water troughs in this management unit.
- There appears to be a well casing near the southwest corner of S-2 with an old pressure tank nearby. If the well casing and pressure tank are removed should be properly capped.

SHADED AREAS

- Some of the new pasture configurations do not provide adequate shade for cattle herds in all pastures. Until mitigation boundary fences are in place, it is unclear how much shade will be provided by existing trees. Adequate shade (30 to 40 sq. ft. per cow) should be provided following the USDA NRCS guidelines.

5.4.4.2 GRAZING PRESCRIPTION

The grazing prescription for the SMU is summarized in Table 5-5.

5.4.4.3 INVASIVE SPECIES MANAGEMENT

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry is present in the understory of pasture S-1 and along the fence lines of pastures S-1–S-4. Himalayan blackberry control may be required to remove and replace fences and gates. The MMP does not require blackberry control; therefore, if it is determined fences in this management unit do not need replacement; blackberry control measures will not be implemented.

Harding grass is present in S-1 and could be controlled using chemical spot treatments. Small medusahead patches occur throughout S-4. Yellow starthistle is not prevalent but could occur in uplands near the county road.

5.4.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily. Photo-guides should be used to estimate RDM. RDM on large areas that appear to be below the target can be clipped to verify RDM quantitatively. Clipping of a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season should be adequate to quantify RDM levels. Smaller areas of low RDM will occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Table 5-5. Grazing Prescription for the South Management Unit

Action	Description of Grazing Prescription
Location of grazing	Pastures S-1–S-4 can be grazed. S-1 is dominated by riparian forest and has very little grazing capacity. The wetland establishment area in pasture S-3 will be fenced to permanently exclude grazing. Likewise, the wetland rehabilitation areas in pasture S-4 will be permanently fenced to exclude grazing.
Stocking rate	The stocking rate for pastures S-2 and S-3 is 3 to 4 AUMs per acre/yr. S-1 has very little grazing capacity. It could be grazed at the same time as S-2 just by opening the gates. Livestock should be removed and the gates closed when the target RDM is reached. Pasture S-4 is drier and should be managed as rangeland, keeping stocking rates at 1.5 to 2 AUMs per acre per year. If high RDM remains on this parcel in October for 3 or more years, it may be appropriate to increase the stocking rate. High stock densities may be applied to manage medusahead during the spring just before medusahead flowers.
RDM target	1,200 to 1,500 lb/acre for the seasonal wet meadows of pasture S1-3 and 1,000 to 1,500 lb/acre for the drier S4 pasture.
Season of grazing	The season of use for pastures S- 1–S-3 is May 1 through October 31. The season of use for the drier pasture S4 can be seasonal or year around continuous as long as the RDM target is met.
Frequency and duration of grazing	Currently these parcels have two different lessees, and some of the parcels are quite small. This restricts the potential to manipulate frequency and duration of grazing via a rotational grazing system. A seasonal grazing system that follows RDM guidelines and uses pastures S-1–S-3 from May 1 through October and pasture S4 anytime during the year is recommended.
Hay harvest	Portions of SMU may be harvested for hay and grazed to meet the RDM target.
Kind and class of animal	Beef cattle or sheep could graze this management unit. Sheep and goats may be used for weed control.
Grazing guidelines	Management for NCSG is the priority for pasture S-1 and S-2. Grazing in these pastures should follow the grazing guidelines for NCSG in Appendix C. The remaining pastures should be managed for invasive species control, native vegetation increases, and thatch control.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow grazing down to 1,000 lb/acre after rapid spring growth has passed (after July 1).

Density and cover of NCSG and BM populations should be monitored before and after targeted grazing to determine whether grazing practices are achieving desired results. Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.4.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

5.4.6.1 General

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.

5.4.6.2 Special Status Plant–Species Management

- Little is known about the habitat needs of NCSG and BM. Consequently, assumptions about their potential for expansion are not substantiated by science. Likewise, the grazing prescriptions for these species are not based on a good foundation of science. The response of these species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum, the potential extent of expansion of both species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.

5.4.6.3 Shaded Areas

- Pasture S-4 will provide little to no shade for livestock. Shade is an animal welfare issue.

5.5 North Management Unit

The NMU is north of WMU, MMU, and EMU (Figure 5-5). This unit includes the terminus of Berry Creek. This management unit is bounded on the west by US 101 and on the east by Reynolds Highway.

5.5.1 Past and Present Grazing Practices

Pastures N1 and N2 consist of wet meadow and rangeland (upland) vegetation. The eastern upland portion along Reynolds Highway is dominated by annual rangeland species. In June 2011 the rangeland on the eastside of N1 and N2 had an estimated standing crop of 3,100 lb/acre (Table 2-1). The wet meadow on the west side of N1 and N2 had an estimated standing crop of 7,000 lb/acre in June 2011. This parcel currently is grazed year-round by 50 beef cows with calves.

5.5.2 Mitigation Actions

The mitigation actions in the NMU are wetland establishment, wetland rehabilitation (no grazing; planting and seeding), wetland rehabilitation (grazing only), and oak planting. The mitigation actions that preclude grazing have been excluded from the grazed areas in the NMU by exclusion fencing as shown in Figure 5-5.

5.5.3 Performance Standards

The performance standards for the mitigation, as they relate to grazing practices, are maintaining and improving wetland plant species cover and composition and maintaining and improving BM and NCSG habitat. The grazing-related performance standards associated with the mitigation actions that will occur in this management unit are identified in Chapter 9 of the State MMP.

5.5.4 Grazing Management Recommendations

5.5.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-5. The recommended grazing infrastructure is shown in Figure 5-5. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- The NMU contains populations of BM. When possible, water troughs and other infrastructure should be field located to avoid populations of these plants.

FENCES AND GATES

- The fences surrounding this NMU are old but serviceable, and the gates are functional. The current lessee keeps the fences in good repair. Caltrans proposes to replace all perimeter fences and to fence all riparian corridors and areas designated for wetland establishment or rehabilitation covered by the MMPs (Figure 5-5).
- Remove and replace the management unit perimeter fences.
- Install fence to separate the grazed portions of the eastern parcel from the west end of the management unit (Figure 5-5).
- While the western Watson parcel and the southwest corner of the eastern parcel will no longer be grazed, gates should be installed to facilitate access to the western parcel.
- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. Fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.
- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and is typically the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Gates should be installed at the locations shown in Figure 5-5. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment, including hay-making equipment

ALLEYWAYS AND STREAM CROSSINGS

- Replace the alleyway fence to form pastures N-1 and N-2 that can be grazed continuously as is currently practiced (Figure 5-5). The density and extent of the BM populations in this parcel have been observed to be one of the best in the valley. Therefore, it is recommended that yearlong continuous grazing continue but that RDM targets identified in the following section should be followed.
- While the western Watson parcel and the southwest corner of the eastern parcel will no longer be grazed, stream crossings should be installed to facilitate access to the western parcel.

ACCESS AND RIGHT-OF-WAY

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.
- Right-of-way agreements should be established between Caltrans and adjacent landowners to provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels.
- Water troughs, wells, pipelines, and other infrastructure are shown on Figure 5-5.

WATER TROUGHS AND WATER SOURCE

There is one water trough at the west end of the alleyway (see Figure 2-5).

- Pastures N-1 and N-2 will need additional water troughs and additional water developments depending on the source of water for these troughs.

CORRALS AND STAGING AREAS

- Access to the NMU is currently available from Reynolds Highway. A new corral and staging area may be needed.

SHADED AREAS

- Some of the new pasture configurations do not provide adequate shade for cattle herds in all pastures. Until mitigation boundaries fence are in place, it is unclear how much shade will be provided by existing trees. Adequate shade (30 to 40 sq. ft. per cow) should be provided following the USDA NRCS guidelines.

5.5.4.2 GRAZING PRESCRIPTION

The grazing prescription for the NMU is summarized in Table 5-6.

Table 5-6. Grazing Prescription for the North Management Unit

Action	Description of Grazing Prescription
Location of grazing	Pastures N-1 and N-2 will be grazed but the wetland establishment areas will be permanently fenced to prevent grazing.
Stocking rate	The stocking rates for this parcel are 4 to 5.5 AUMs/acre/year.
RDM target	1,000 to 1,500 lb/acre.
Season of grazing	Continuous yearlong grazing.
Frequency and duration of grazing	Pastures N-1 and N-2 have been grazed yearlong for many years. The density and extent of the BM populations in this parcel have been observed to be one of the best in the valley (Hulse-Stephens pers. comm.). Therefore, it is recommended that yearlong continuous grazing continue but that RDM targets are followed.
Hay harvest	This parcel could be harvested for hay and grazed to meet the RDM target.
Kind and class of animal	Beef cows and calves are best choice for 1,000 to 1,500 lb RDM targets. Sheep are an acceptable alternative, but they must be managed closely to meet the RDM target. Sheep and goats may be used for weed control after BM sets seed.
Grazing guidelines	Management for BM should follow the guidelines in Appendix B.
Drought and post-fire practices	Shorten grazing season, and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow lessees to feed hay.

5.5.4.3 INVASIVE SPECIES MANAGEMENT

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry control may be required to remove and replace fences and gates. The MMP does not require blackberry control in the riparian corridors; therefore, if it is determined that fences in this management unit do not need replacement; blackberry control measures will not be implemented.

Medusahead and yellow starthistle control may be needed in the drier portion of this parcel adjacent to Reynolds Highway.

5.5.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily. Photo-guides should be used to estimate RDM. RDM on large areas that appear to be below the target can be clipped to verify RDM quantitatively. Clipping of a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season should be adequate to quantify RDM levels. Smaller areas of low RDM will occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Density and cover of BM populations should be monitored following targeted grazing to determine whether grazing practices are achieving desired results. Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.5.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

5.5.6.1 General

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.

5.5.6.2 Livestock Access and Movement

- Gates should be placed and built so that they facilitate herd movement.

5.5.6.3 Special Status Plant–Species Management

- Little is known about the habitat needs of NCSG or BM. Consequently, assumptions about their potential for expansion are not substantiated by science. Likewise, the grazing prescriptions for these species are not based on a good foundation of science. The response of these species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum, the potential extent of expansion of both species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.

5.5.6.4 Shaded Areas

- Pasture N-2 will provide little to no shade for livestock. Shade is an animal welfare issue.

5.6 Oak Woodland Management Unit

The OWMU is a mosaic of oak woodland and annual grassland patches on steep terrain. The OWMU is about 1 mile north of Reynolds Highway (Figure 5-6). There are no riparian corridors associated with this management unit.

5.6.1 Past and Present Grazing Practices

The OWMU historically has been grazed and currently is grazed as part of a larger area that supports about 65 cows. The current stocking rate of the annual rangeland portion of this parcel is about 30 acre/AUM, and grazing occurs from December through May. The estimated standing crop in May 2011 was 3,300 lb/acre, which is more than enough to support this stocking rate.

5.6.2 Mitigation Actions

Preservation is the action on this management unit. Grazing will not be excluded from any portion of this management unit.

5.6.3 Performance Standards

There are no performance standards related to this management unit; however, the unit will be managed in a manner that maintains its current condition.

5.6.4 Grazing Management Recommendations

5.6.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-6. The recommended grazing infrastructure is shown in Figure 5-6. The following infrastructure and management changes are recommended.

GENERAL

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.

FENCES AND GATES

- All of the fences in this parcel need to be replaced or upgraded (Figure 5-6); however, because of steep terrain, dense vegetation, and high erosion risk, fence construction may not follow the parcel lines.
- There are no existing fences or gates on this management unit (Figure 2-6). Caltrans should evaluate the need for perimeter and interior fences.

- Gates should be placed and built so that they facilitate herd movement. The grazing manager (often the lessee or employee) knows the travel paths of the herd and is typically the best person to decide the location of new infrastructure. Travel paths and the location of gates and stream crossings are part of herd memory that is passed down from mother to offspring.
- Gates should be installed at the locations shown in Figure 5-6. Gates should be 16-foot and made of tubular steel (e.g., Behlen® gates) to facilitate movement of livestock, people, and equipment.
- Bear, elk, and deer all reside in Little Lake Valley. These species may damage existing fences in Little Lake Valley and result in significant repair expenses. If used, fencing should be designed to accommodate the movement of these large animals (Appendix E). Electric fencing is not a viable option as these animals typically do not respect the fence and may quickly break through, sometimes taking part of the fencing with them.

Alleyways and Stream Crossings

- The OWMU occurs on steep terrain with ephemeral drainages. If interior fence is installed, crossings should be placed and built so that they facilitate herd movement.

Access and Right-of-Way

- It is recommended that livestock management flexibility be part of adaptive management. Because of health, safety, and grazing system function concerns, lessees should have the flexibility to perform infrastructure repairs as they occur if such actions must happen immediately.

Corrals and Staging Areas

- Access to the NMU is currently available from Reynolds Highway. A new corral and staging area may be needed.

Water Troughs and Water Source

- The OWMU has seasonal stockwater ponds that commonly dry out in late spring or summer (Figure 5-6). Development of water (pump, storage tanks, etc.) in the upper parts of this unit could improve grazing distribution.

Shaded Areas

- The OWMU provides sufficient shade for livestock, so additional shaded areas are not recommended for this management unit.

5.6.4.2 GRAZING PRESCRIPTION

The grazing prescription for the OWMU is summarized in Table 5-7.

5.6.4.3 INVASIVE SPECIES MANAGEMENT

Control methods for invasive species are discussed in Chapter 4. Yellow starthistle and medusahead control are needed on this management unit. Himalayan blackberry, reed canarygrass, Harding grass, and teasel are not a concern for this parcel because the steep terrain, dry soil conditions, and shading by mature trees will not support these species.

Table 5-7. Grazing Prescription for the Oak Woodland Management Unit

Action	Description of Grazing Prescription
Location of grazing	This entire management unit is open to grazing. Steep slopes and dense trees and shrubs limit livestock use of large areas of these four parcels.
Stocking rate	The stocking rate for the Taylor rangeland parcels is about 30 acres per AUM (03333 AUMs/acre). The stocking rate could be increased as long as RDM targets are not exceeded and erosion, trampling, or browsing of young tree saplings does not become a problem.
RDM target	1,000 to 1,500 lb/acre on the annual rangelands.
Season of grazing	December through May. Year around would be OK if stock water were available.
Frequency and duration of grazing	Continuous grazing during the season of use, but some areas may be underused because of lack of stock water in some seasons. Stock water (seasonal sources) limits grazing. Adding a well could improve stock water and extend the season of grazing.
Hay harvest	None
Kind and class of animal	Beef cattle currently graze the OWMU. The management unit could be grazed by sheep. Sheep and goats may be used for weed control.
Grazing guidelines	Maintain adequate RDM to minimize erosion risk, and avoid excessive trampling and browsing of tree saplings and shrubs.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow grazing down to 1,000 lb /acre after rapid spring growth has past (after July 1).

5.6.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily. Photo-guides (Guenther 1998) should be used to estimate RDM. RDM on large areas that appear to be below the target can be clipped to verify RDM quantitatively. Clipping of a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season should be adequate to quantify RDM levels. Smaller areas of low RDM will

occur around stock water, stream crossings, and favored shade trees and should not be sampled unless they are part of a larger heavily grazed area.

Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.6.6 Management Issues and Considerations

The following management issues and considerations were identified based on field survey observations and through coordination with current lessees.

- It is recommended that the current grazing lessees be involved in the decisions about where to place pasture infrastructure (internal fences, gates, water developments, and stream crossings) because several lessees have managed livestock grazing on these parcels and are familiar with the existing and required grazing infrastructure needs.
- Steep terrain and seasonal water limit manipulation of livestock distribution.

5.7 North Coast Semaphore Grass Management Unit

The NCSGMU consists of a 3.27-acre parcel located adjacent to the bypass alignment (Figure 5-7). The NCSGMU was previously part of a larger parcel that was purchased by Caltrans for the bypass project. The NCSGMU was purchased to preserve existing populations of NCSG.

The NCSGMU is bounded on the south by the bypass alignment and on the north and east by parcels owned by the City of Willits. There are no riparian corridors associated with this management unit.

5.7.1 Past and Present Grazing Practices

The NCSGMU (pasture SG1) is a wet meadow that could be mowed or grazed to maintain or increase NCSG (Figure 5-7). In the past, this small parcel has been harvested for hay and grazed as part of a larger 40-acre parcel.

5.7.2 Mitigation Actions

The mitigation action in the NCSGMU is NCSG establishment. Grazing or mowing will be used to manage NCSG populations.

5.7.3 Performance Standards

There are no formal performance standards for this management unit. Caltrans will monitor the NCSG study plots to obtain information on the outcome of the NCSG transplant effort. The study objective is to maintain or improve NCSG populations.

5.7.4 Grazing Management Recommendations

5.7.4.1 GRAZING INFRASTRUCTURE

The existing grazing infrastructure is shown in Figure 2-7. The recommended grazing infrastructure is shown in Figure 5-7.

The future management action for this management unit has not been determined because the unit is isolated and livestock access will require agreements with adjacent landowners. If grazing is not feasible, the management unit may be mowed or hayed. The following infrastructure and management changes are recommended but are subject to change based on the management action.

GENERAL

- The NCSGMU contains populations of BM and NCSG. Water developments must be field located to avoid populations of these plants and the NCSG transplant areas.

FENCES AND GATES

- Some of the fences surrounding the NCSGMU are in need of replacement. New gates are recommended to access the site and should be installed in the new perimeter fence on the north side and possibly the east side. The site will abut the bypass on the south and west sides; therefore, these sides will not allow for livestock access. The location of the access gates should consider and avoid NCSG transplant polygons and existing stands of NCSG.

ALLEYWAYS AND STREAM CROSSINGS

- Depending on the access to the site determined by Caltrans an alleyway providing access from the north via an easement from the WMU may be necessary. There are no stream crossings in this management unit.

ACCESS AND RIGHT-OF-WAY

- Access to the unit could be along the Caltrans ROW and under the viaduct or an access easement on the south side of US 101 or from the north as mentioned above. Right-of-way agreements could be established between Caltrans and adjacent landowners to

provide alleyways (if applicable) to access the mitigation parcels in the event of an emergency and to maintain grazing infrastructure (if it occurs) on adjacent parcels

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CORRALS AND STAGING AREAS

- At least one corral is needed. SG-4 is one potential location for a new set of corrals.

WATER TROUGHS AND WATER SOURCE

- Pasture SG-1 will need a water trough if it is grazed. An approximate location for this water trough is shown in Figure 5-7.

SHADED AREAS

- The existing trees on the north boundary could provide some shade for livestock during parts of the day and season. The available shade level should be evaluated to determine whether it provides adequate cover.

5.7.4.2 GRAZING PRESCRIPTION

The grazing prescription for the NCSGMU is summarized in Table 5-8.

Table 5-8. Grazing Prescription for the North Coast Semaphore Grass Management Unit

Action	Description of Grazing Prescription
Location of grazing	The entire management unit is to be grazed or mowed.
Stocking rate	4.5 AUMs/acre/yr to 6.5 AUMs/acre/yr depending on the actual length of the grazing season.
RDM target	1,200 to 1,500 lb /acre.
Season of grazing	May 1 through October.
Frequency and duration of grazing	If this unit is grazed, it should be grazed to maintain stubble height at 8 to 12 inches (1,200 to 1,500 lb/acre RDM) so that shading of NCSG is minimized. Because this unit is so small and access is more difficult, it may be difficult to find a lessee. It may be easier to have the unit mowed each summer. Mowed vegetation should be baled and removed. Grazing or mowing practices should follow the targeted grazing guidelines for NCSG (Appendix C.)
Hay harvest	Because of the small size and difficult access, it is recommended that this management unit be harvested for hay.
Kind and class of animal	Because of the small size of this unit, sheep grazing may be more appropriate than cattle grazing. Sheep and goats may be used for weed control.
Grazing guidelines	Management for NCSG is the priority for this parcel and should follow the grazing and monitoring guidelines in Appendix C.
Drought and post-fire practices	Shorten grazing season and reduce the stocking rate (AUMs) so that the RDM does not go below the target. Allow lessees to feed hay.

5.7.4.3 INVASIVE SPECIES MANAGEMENT PRACTICES

Control methods for invasive species are discussed in Chapter 4. Himalayan blackberry is present along the fence lines and in the riparian corridors and should be controlled. Himalayan blackberry control is not needed at this time but may be required if in the future it is determined to be negatively affecting NCSG populations.

Teasel, Harding grass, and reed canarygrass were not observed but may be present in the future and could be controlled using chemical spot treatments. Medusahead and yellow starthistle were not observed in this parcel and would not be expected to colonize because the majority of the management unit is wet meadow.

5.7.5 Monitoring Recommendations

RDM should be assessed around October 1 (before the start of the rainy season) to identify areas that have been grazed too heavily and to ensure that NCSG areas are receiving adequate grazing to reduce competition from other species. Photo-guides should be used to estimate RDM. Large areas that appear to be below the target can be sampled by clipping a few (5 to 10) quadrats (1 sq. ft. or 0.96 sq. ft.) near the end of the grazing season.

Density and cover of NCSG populations should be monitored following targeted grazing or mowing to determine whether current grazing practices are achieving desired results. Invasive species should be monitored to detect extent, spread over time, and effectiveness of control. Often annual photographs can be used for monitoring. Measures of density and cover may be useful to detect small changes in invasive weed populations.

5.7.6 Management Issues and Considerations

Access issues and the small size of the NCSGMU may prevent Caltrans from finding a lessee interested in grazing the unit.

If livestock access issues are too difficult, haying the unit may be more feasible, especially if Caltrans could interest the owner of the surrounding property in harvesting the hay. It may be necessary to give the neighbor the hay in exchange for harvesting the hay.

Little is known about the habitat needs of NCSG. Consequently, assumptions about the potential for expansion are not substantiated by science. Likewise, the grazing prescriptions are not based on a good foundation of science. The response of this species to grazing, their palatability to livestock, and other key knowledge are not available to guide management. At a minimum, the

potential extent of expansion of the species should be determined by field experimentation, and response to clipping and grazing should be studied during controlled studies in the field.

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Appendix A Glossary of Terms

Adaptive management: a form of management based on experimentation (trial and error). Guided by measurable objectives, it allows managers to monitor and evaluate management practices as they go along.

Animal unit (AU): One mature cow of approximately 1,000 pounds body weight.

Animal unit month (AUM): The amount of dry forage required by 1 animal unit for 1 month.

Browse: That part of leaf and twig growth of shrubs, woody vines, and trees available for consumption by livestock or wildlife.

Carrying capacity: The maximum stocking rate possible that is consistent with maintaining or improving vegetation or related resources. It may vary from year to year on the same area as a result of fluctuating forage production.

Class of animal: Description of age and/or sex-group for a particular kind of animal. For example, cow, calf, yearly, ewe, doe, fawn, etc.

Cool-Season Plant: a plant that generally makes the major portion of its growth during the late fall, winter, and spring.

Continuous grazing: The grazing of a specific unit by livestock throughout a year or for that part of the year during which grazing is feasible. The term is not necessarily synonymous with year-long grazing, because seasonal grazing may be involved.

Drought: A prolonged chronic shortage of water, as compared to the norm, often associated with high temperatures and winds during spring, summer, and fall. A period without precipitation during which the soil water content is reduced to such an extent that plants suffer from lack of water.

Duration of grazing: Length of the grazing period.

Enclosure: Area fenced to confine animals.

Flash grazing: Grazing a targeted area at a relatively high stocking density for a short period of time, typically involves not more than two to four days. This is the preferred management practice if livestock will have access to a stream and riparian area.

Forage: Browse and herbage that are available for food for grazing animals or to be harvested for feeding.

Forage production: The weight of forage that is produced within a designated period of time on a given area (e.g., pounds per acre).

Forb: Any broad-leafed herbaceous plant other than those in the grass, sedge, or rush families.

Frequency of Grazing: How often a pasture is grazed.

Grass: a plant with long, narrow leaves having parallel veins and nondescript flowers. Stems are hollow or pithy in cross section.

Graze/grazing: The consumption of standing forage by livestock or wildlife.

Grazing period: Length of time that animals are allowed to graze a specific area.

Grazing management: the manipulation of grazing and browsing animals to accomplish a desired result.

Grazing pressure: An animal-to-forage relationship measured in terms of animal units per unit weight of forage at any instant (e.g., AU/ton).

Grazing system: Grazing management that defines the periods of grazing and non-grazing.

Grazing management unit: A grazing area enclosed and separated from other areas by fencing or other barriers.

Herd memory: Landscape and vegetation knowledge passed on from mother to offspring in a herd of grazing animals.

Intensity of grazing: Intensity of grazing is the degree of use resulting from the number of animals and length of the grazing period. It may be reported as percent utilization or amount of residue or stubble height remaining at end of grazing period.

Invasive species: An alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Litter: The uppermost layer of organic debris on the soil surface; essentially the freshly fallen or standing dry vegetation.

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress of management objectives.

Native species: A species that is a part of the original fauna or flora of the area in question.

Non-native: A species which is not part of the original fauna or flora of the area in question.

Prescribed grazing: Managing the controlled harvest of vegetation with grazing animals to meet management objectives (NRCS).

Overgrazing: Continued heavy grazing that exceeds the recovery capacity of the community and creates a deteriorated range.

Pasture: Land that is seeded with introduced pasture grasses and legumes, fertilized and irrigated.

Photo-points: Repeat photography of an area of interest over a period of time, with photographs taken from the same location and with the same field of view as the original photo**.**

Plant community: An assemblage of plants occurring together at any point in time, denoting no particular ecological status.

Plant vigor: plant health; relates to the relative robustness of a plant in comparison to other individuals of the same species.

Prehend: To take hold of during grazing.

Prescribed grazing: Managing the controlled harvest of vegetation with grazing animals to meet management objectives (NRCS).

Rangeland: Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs. Rangelands may include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Residual dry matter (RDM): The amount of old plant material left on the ground at the beginning of a new growing season.

Rest: Leaving an area ungrazed for a specific time.

Rest period: The length of time that a management unit is not grazed.

Riparian zone: The banks and adjacent areas of water bodies, watercourses, seeps, and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a moister habitat than that of contiguous floodplains and uplands.

Rotational grazing: A grazing scheme in which animals are moved from one grazing unit in the same group of grazing units to another unrelated to specific graze rest periods or levels of plant defoliation.

Season of grazing: The period(s) of the year that grazing occurs. *Season of grazing* may refer to the seasons of the year (fall, winter, spring, summer) but also can refer to other periods. For example, *season of grazing* could be defined as the dry season, wet season, or just a few weeks of grazing that fit the goals of the grazing manager.

Seasonal grazing: Grazing restricted to a specific season or time of year.

Season-long continuous grazing: Continuous grazing for a season.

Seasonal-long rotational grazing: Rotational grazing for a season.

Species composition: The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, or weight.

Stock density: the relationship between the number of animals and the area of land at any given time.

Stocking rate: The number of specific kinds and classes of animals grazing or using a unit of land for a specified period of time. May be expressed as animal unit months per acre.

Targeted grazing: Targeted grazing is the application of a specific kind of livestock at a determined season, duration, and intensity to accomplish defined vegetation or landscape goals. This concept has been around for decades and has taken many names, including *prescribed grazing* and *managed herbivory* (Launchbaugh and Walker 2006).

Thatch: A term for excessive litter that has gained common usage by restoration managers in California.

Unpalatable: Not agreeable to taste, disliked; can result in animal avoidance of a particular species or plant part that could be consumed.

Use: the proportion of current year's forage production that is consumed or destroyed by grazing animals.

Utilization: see *Use*. **Weed:** A plant growing where it is unwanted. A plant having a negative value within a given management system.

Wet meadow: A meadow where the surface remains wet or moist throughout the growing season.

Year-long grazing: Not a proper grazing management term. Often means year-long grazing or year-long continuous grazing.

Yearlong grazing: Continuous grazing for a calendar year. *Note: Most of these definitions follow those published in Rangeland terminology published by the Society for Range Management (1989).*

Appendix B Recommendations for Grazing to Maintain or Increase Baker's Meadowfoam

Based on what has been observed by Geri Hulse-Stephens and others, the recommended grazing regime for maintaining and potentially increasing Baker's meadowfoam (BM) patches is to graze during seed set (mid- to late May) to trample the seeds into the soil and to reduce competing vegetation and thatch by grazing and/or mowing to a residual dry matter (RDM) weight of 1,500 pounds per acre (lb/ac) by October 31. However, within an adaptive management framework, grazing effects should be monitored to fine tune the proper timing and intensity of grazing for maintaining and increasing BM. The following practices are recommended for maintaining BM.

1. BM patches should be grazed during seed set so the seeds are trampled into the soil.
    a. One potential problem with this grazing regime is that there are not enough cattle to graze all of the BM patches during seed set. This problem offers an opportunity to compare BM patches that are grazed during seed set to those that are not. This comparison should be conducted to confirm that trampling seed into the soil actually results in increased BM density as has been observed.
    b. Seven new BM pastures (E2, E4, E5 M4, M5, M6, M7 [Figures 5-2 and 5-3 of GMP]) are proposed in the fencing recommendations. Some could be grazed during seed set and others could be left ungrazed during seed set. BM density in patches in each pasture should be determined before applying this grazing regime and compared to BM density measured during the spring after the grazing regime is applied. This test should be conducted for 3 or more years so that weather influences on treatment effects can be assessed.
    c. There are several smaller patches of BM that also could be treated following these guidelines.
2. Following are some additional practices that could be tested as part of an adaptive management program.
    a. If cattle concentration is insufficient to adequately trample BM seed, try: (1) to maximize trampling, use electric fences to confine cattle to BM patches, and/or (2) place salt and/or dehydrated molasses supplements (e.g. Crystalyx®) near BM patches to attract livestock into the BM patches.
    b. BM patches that are not trampled during seed set should be grazed at high densities after the soil dries in an attempt to improved seed contact with the soil. High animal density may be achieved by enclosing cattle with electric fence or by attracting cattle by placing salt and/or protein supplements near the BM patches. The grazing manager will need to monitor enclosed cattle or attractant areas to ensure that grazing and trampling are not too heavy. The grazing manager may have to learn by trial and error (adaptive management) when to end this grazing treatment.
    c. If shading from competing vegetation is believed to be restricting the growth and expansion of BM in March and April, it may be desirable to graze some BM patches during that period. Standing water and muddy soils could restrict application of this practice. Under close monitoring, this should be tried on a small scale so that BM impacts and trampling of muddy soils can evaluated. Pastures that are grazed in April also should be grazed at BM seed set as described above.

3. To maintain the dense stands of BM in the east end of the Watson parcel, which includes upland sites dominated by annual grasses and forbs, continuous year-around grazing should be continued but closely monitored to maintain adequate RDM of 1,000 lb/ac.
4. After seed set, maturation, and drying of BM plants, grazing can continue through the summer and early fall with the goal of reducing RDM in and near BM patches to 1,000 to 1,500 lb/ac.
5. Density of BM patches that receive these grazing treatments should be compared to those that do not. This will inform the adaptive grazing manager so that practices can be adjusted as needed.

Appendix C Recommendations for Grazing to Maintain or Increase North Coast Semaphore Grass

Following an adaptive management approach, grazing and mowing can be applied to reduce competition to North Coast semaphore grass (NCSG) using the following practices:

1. To minimize shading of NCSG by taller competing grasses, graze NCSG patches to maintain standing crop at about 8 to 12 inches in height.
    a. NCSG patches should be rested at least 30 days between grazing periods. This is best done using rotational grazing.
    b. Where rotational grazing is practiced, introduced competitors and NCSG may be reduced in height during each grazing period and then regrow during rest periods. Rest between grazing periods allows NCSG and introduced species to recover.
    c. Fall vegetation should be reduced in height so that NCSG will not be shaded during the winter and early spring growing season. An RDM of 1,200 to 1,500 lb/ac should facilitate this.
2. Following are some additional practices that could be tested as part of an adaptive management program.
    a. If shading from competing vegetation is believed to be restricting the growth and expansion of NCSG in March and April, it may be desirable to graze some NCSG patches during that period. Standing water and muddy soils could restrict application of this practice. Under close monitoring, this should be tried on a small scale so that NCSG impacts and trampling of muddy soils can evaluated.
3. Competitors to NCSG grow rapidly in April and May, potentially beginning to shade NCSG. These introduced competitors will reach heights of 3 to 5 feet by June, shading associated NCSG plants. Therefore grazing or mowing needs to be applied to prevent introduced perennial grasses from shading NCSG.
4. In most years a May through October season of use prevents grazing when soils are wet. However, it may be desirable to begin reducing the height of competing species by grazing NCSG patches earlier. The grazing manager should observe height increases of competitors starting in March and learn to gauge when grazing or mowing needs to be applied to reduce the height of introduced perennial grasses.
5. Monitor and compare NCSG populations in grazed, mowed, and untreated patches. NCSG patches should be monitored annually in the spring.
6. Ideally controlled clipping and grazing experiments should be conducted to determine the proper season, intensity and frequency of grazing or mowing that would enhance NCSG and suppress competing vegetation. As stated in Chapter 3, the effects of no grazing, following an adaptive management approach incorporating plant population characteristic monitoring, and various intensities and timings of grazing could be tested and compared in adjacent small pastures or small sections of larger pastures separated by temporary electric fencing.

Appendix D Websites That Support This Grazing Management Plan

D.1 Rangeland Management

California Rangeland Research and Information Center
http://californiarangeland.ucdavis.edu/

California Rangeland Watershed Laboratory
http://rangelandwatersheds.ucdavis.edu/

UCCE Livestock and Range Topics: Educational Information for Range Livestock Producers and Managers
http://ucanr.org/blogs/LivestockRangeTopics/

California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands.
http://californiarangeland.ucdavis.edu/Publications%20pdf/8092.pdf

Photo Monitoring for Better Land Use Planning and Assessment
http://anrcatalog.ucdavis.edu/pdf/8067.pdf

USDA NRCS Conservation Benefits of Rangeland Practices: Assessment, Recommendations, and Knowledge Gaps
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/ceap/?&cid=stelprdb1045811

Targeted Grazing
http://www.cnr.uidaho.edu/rx-grazing/handbook.htm

D.2 Invasive Species Management

Reed Canary Grass Fact Sheet.
http://dnr.wi.gov/invasives/fact/reed_canary.htm.

Common Teasel Fact Sheet
http://dnr.wi.gov/invasives/fact/teasel_com.htm

Medusahead
http://www.blm.gov/ca/st/en/fo/alturas/altweed/plants/medusa.html.

Yellow Starthistle
http://www.cal-ipc.org/ip/management/yst.php
Creeping Bentgrass
http://www.cal-ipc.org/ip/management/plant_profiles/Agrostis_stolonifera.php

Tall Fescue
http://www.cal-ipc.org/ip/management/plant_profiles/Festuca_arundinacea.php

Velvet Grass (Yorkshire Fog)
http://www.cal-ipc.org/ip/management/plant_profiles/Holcus_lanatus.php

Harding Grass
http://www.cal-ipc.org/ip/management/plant_profiles/Phalaris_aquatica.php

Reed Canarygrass
http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua011.html

Himalayan Blackberry
http://www.cal-ipc.org/ip/management/plant_profiles/Rubus_armeniacus.php

tncweeds.ucdavis.edu/moredocs/rubarm01.pdf
http://www.coosswcd.oacd.org/him_blackberry_text.htm

Appendix E Fence Guidelines

E.1 General Guidelines and Discussion

Livestock fencing requirements vary by grazing/farming management objectives, species, age and sex of animals contained, topography, climate conditions, predator control, ecological restoration requirements, maintenance issues, aesthetic concerns, and cost. In general, livestock fencing occurs as one of three types:

- boundary or perimeter fencing—used to keep livestock on site, with predation protection, and to define a management unit that is spatially unique from other units;
- cross-fencing or paddock fencing—used to control livestock distribution and achieve grazing management objectives by controlling the space, density, and duration of grazing; and
- exclosure fencing—used to protect temporarily or permanently resources that might be damaged by grazing or for monitoring by compare-and-contrast methods.

Adequate perimeter fencing to contain livestock also is required by California law (Food and Agriculture Code 17121) as Mendocino County is not considered a *free-range* county.

Wildlife friendly fencing will be used, as stated in the MMP, which requires deviation from the traditional livestock fencing specifications. Refer to the MMP for more information on the wildlife fencing specification.

E.2 Description of Fence Material

Traditional livestock fencing materials have included barbed, woven, mesh, and electrified wire and combinations of these materials. Different types of posts include treated wood, metal, and fiberglass.

E.2.1 Barbed Wire Fence

Barbed wire is the most commonly used material for cattle, but it also can be used for sheep and goats if properly spaced and will deter some predators. For sheep and goats, the bottom spacing must be closer with the first wire no more than 6 inches off the ground and the second wire 6 inches up from that. If predators are a problem, the first barbed wire is placed practically on the ground (0 to 2 inches) to discourage coyotes and domestic dogs from burrowing under the fence. The remaining wires that follow need to be spaced 8 inches apart. Typically sheep fences are only 4 feet high, but goats will need the same height as cattle. A drawback of barbed wire for sheep and angora goats is that their fleece often gets caught on the barbs.

Barbed wire consists of two or more strands of smooth, galvanized wire twisted together with two or four sharp barbs spaced every 4 to 5 inches (Figure E-1). Standard barbed wire fences usually have three to five strands of barbed wire stretched between posts. Typical fence height is either 51 or 54 inches. Spacing between wires depends on the number of line wires and fence height (Figure E-2). Line posts are usually spaced 12 to 20 feet apart.

Figure E-1: 2 & 4 Barbed Wire

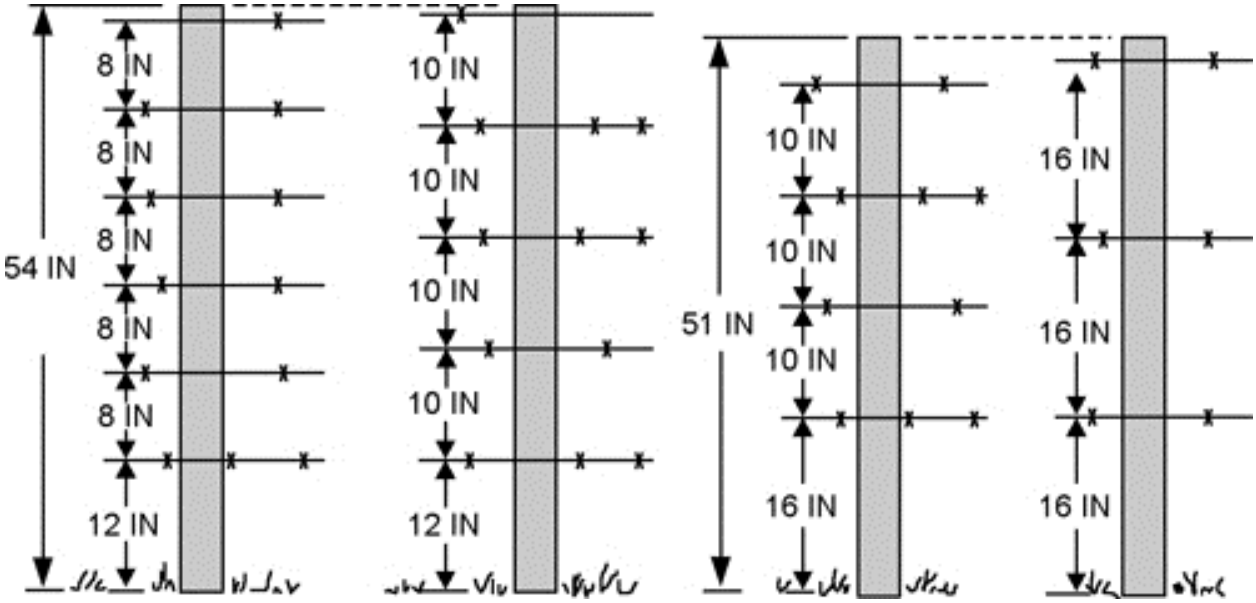


Figure E-2: Common Line Spacing for Barbed Wire Fences

E.2.2 Suspension Barbed Wire Fence

Suspension barbed wire fences consist of four to six strands of 12½-gauge barbed wire stretched taut so no more than 3 inches of sag exists between posts. The wire strands are held apart by twisted wire stays or plastic battens or droppers spaced 16 feet apart. Line posts are usually spaced 80 to 120 feet apart. Line posts should be set or driven to a minimum depth of 2½ feet and be tall enough for about 3–4 inches showing above the top wire.

E.2.3 Woven Wire Fence

Woven wire is more often used for sheep and goats as it is a tighter fence that prevents young lambs or kids from getting out. Heavy or extra heavyweight woven wire fences are excellent for non-horned sheep and goats. Fence height should be at least 48 inches to prevent animals from climbing over the fence. Woven wire fence can be used with cattle provided there are several strands of barbed top wires used to prevent the cattle from rubbing the woven wire down.

Woven wire fences consist of smooth horizontal (line) wires held apart by vertical (stay) wires. Spacing between line wires may vary from 1½ inches at the bottom for small animals to 9 inches at the top for large animals. Wire spacing generally increases with fence height.

E.2.4 Wildlife/Predator Exclusion Fence

Generally, where coyote predation is not a concern, stay wires should be spaced 6 inches apart for sheep and goats and 12 inches apart for large animals. Coyotes, however, can pass through openings as small as 4 1/2 inches, so if predation is a concern, woven wire fences with stay wires close together will prevent predators from entering fenced-in areas. Some manufacturers produce fencing with bottom openings of 6 inches by 3 inches for predator control and 3 inches by 3 inches for predator proofing. Using one strand of barbed wire at ground level with woven wire above and two to three strands of barbed wire on top is the best non-electrified fence for sheep and goats.

If wildlife-friendly fences are required, typically the topmost barbed wire is replaced with a smooth wire of similar gauge. Sometimes lower wires are also replaced with smooth wire, but it is not recommended in this area for cattle. Wildlife-friendly fences also are not recommended if predation is a problem.

Wildlife friendly fencing will be used, as stated in the MMP, which requires deviation from the traditional livestock fencing specifications. Refer to the MMP for more information on the wildlife fencing specification.

E.2.5 Exclosure Fence

For cattle the three-wire barbed fence is adequate. Typical exclosures are used for restoration and for required setbacks from riparian corridors. Unless the exclosure is extremely small, barbed wire drop gates (Figure E-3) should be installed to facilitate removal of stray animals, to allow access for maintenance, and for utility right-of-way requirements. It is not necessary to place cross-creek fences in riparian areas where livestock will cross from one pasture to the next as the animals usually are herded between the two gates, which need to be at minimum 16 feet wide. Cross-creek fences will act as debris traps and can result in excessive erosion or vegetation blow-outs during winter flows. Fences also will hinder wildlife movement in corridors. Where riparian corridors are fenced, it is often better to treat the area as a riparian pasture once woody vegetation goals are met, e.g., once tree species are above browse height (4 to 5 feet). Grazing will stimulate growth of desirable grasses and forbs and control undesirable species in riparian pastures. Timing and season of use need to be part of the adaptive management of riparian pastures.

Figure E-3: Typical Barbed Wire Drop Gate for Three Wire Fence

E.2.6 Wildlife-Friendly Fence and Wildlife Exclusion Fence

There are times when it is necessary to fence wildlife out. If wildlife must be excluded, avoid fencing a large area that includes wildlife habitats. Keep exclusion fence close to the resource you need protected, and allow wildlife to use other parts of the property or pass through.

A permanent non-electric exclusion fence for deer and elk should be 7 to 8 feet high. Different designs can be used, depending on the circumstances. Place gates at corners where an accidentally trapped animal is more likely to find an escape.

A properly maintained fence will give long and trouble-free service. The following items should be a part of a regular maintenance program.

- Repair or replace anchor post assemblies when they show signs of weakness.
- Refasten loose wires to posts and splice broken wires as necessary.
- Keep the fence properly stretched.
- Keep the fence line clear of weeds and brush.

- Monitor fences during high-water events or seasonal flooding.
- Plan and follow a regular inspection routine to identify any needed maintenance.

E.3 Management Unit Considerations

Caltrans has acquired more than 30 parcels for mitigation impacts of the Willits Bypass Project with the intention of leasing the grazing rights on those parcels where grazing is the preferred tool for their management objectives. Presently most of these parcels are not managed individually because of prior ownerships and current grazing leases. Usually a conservation, ranch, or grazing management plan addresses the management of multiple pastures, paddocks or grazing units on a ranch or in a grazing lease, including parcels that are not grazed, that are spatially contiguous.

As part of the offsite mitigation program for the bypass project, Caltrans will replace most perimeter fences and internal fences. Perimeter fences will be installed on the outer boundary of the mitigation parcels. Caltrans will layout and design internal fences to create the individual grazing units (pastures), as identified in the GMP.

As described in the GMP, the mitigation parcels will be divided and grouped into seven management units:

- West Management Unit (WMU)
- Middle Management Unit (MMU)
- East Management Unit (EMU)
- South Management Unit (SMU)
- North Management Unit (NMU)
- Oak Woodland Management Unit (OWMU)
- North Coast Semaphore Grass Management Unit (NCSGMU)

While current lease agreements are based on the parcel designations, it is recommend that Caltrans transition to lease agreements for these management units.

Fencing within the Little Lake Valley management units presents some unique challenges because of high water flows in the winter and wildlife migration patterns. Electric fences will not work in any of the management units as elk and bear will walk through and destroy them.

It is recommended that east – west (running direction) fences not be constructed of woven wire or barbed, with very close spacing, as the high water flows will trap debris and eventually damage or result in the loss of fence segments. This could create a maintenance problem almost every year. East – west fences should use the minimum number of barbed wires to contain livestock. For cattle this is three strands. For sheep or goats four or five strands would suffice, however, this could preempt using them as a grazing tool.

North – south (running direction) fences and most of the perimeter fence can be either a combination of woven wire and barbed wire or more closely spaced barbed wire as in Figure E-2. Five strands of barbed wire alone will work

for cattle and is recommended. Cross and exclosure fences are adequate with 2-barbed wire. If added security is needed 4-barbed wire may be used for perimeter fences and might be justified for use along public roadways.

End posts with H-braces made of 2-inch steel set in concrete will be stronger and last longer than wooden posts. Steel T-posts should be used for all line posts. Gates should be 16 feet wide and made of 2-inch tubular steel (Figure E-4). There are numerous retail suppliers of fence material, gates, and other field equipment and materials hay, or gravel trucks and livestock. For sheep or goats the gates should have welded mesh wire welded to the tubular steel. This size will allow adequate access for fire suppression equipment.

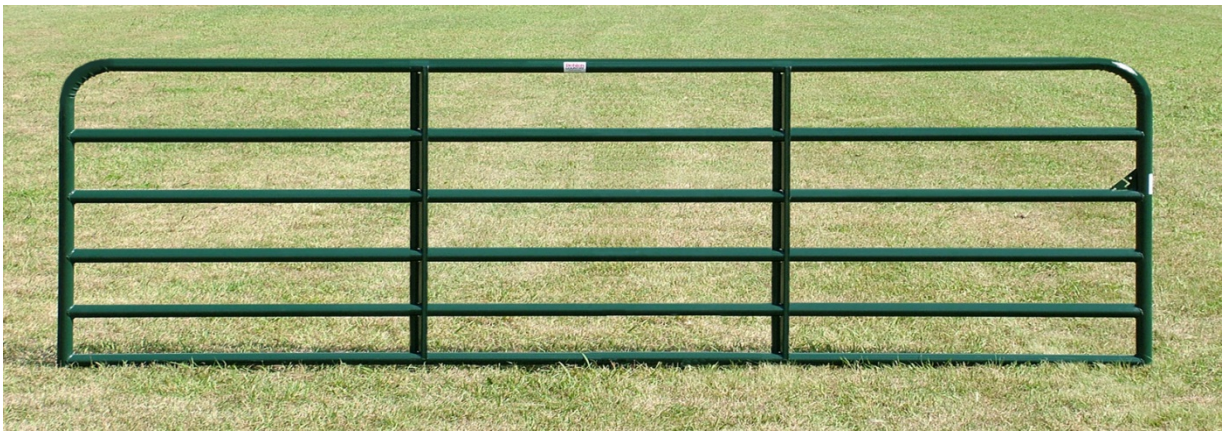


Figure E-4: 16-Foot 2-Inch Tubular Steel Powder Coated Gate by Behlen®

Cattle movements within and between the WMU, MMU, and EMU may be challenging because of wet meadow and riparian corridor mitigation requirements. In some instances, stream crossing will be required to move livestock between pastures. Temporarily fenced alleyways across riparian corridors and creeks are not recommended as it is much easier to use low-stress cattle movement with dogs and horses to cross between gates than to create small impassible spaces that crowd cattle and risk major trampling, injuries, and fence blow-outs. One example of where low-stress movement is preferred over a fenced alleyway is between pasture M-10 to pastures W-4 and W-5. Pastures W-1, W-2, W-3, W-5, and W-6 have similar requirements.

Use of barbed wire drop gates in both riparian corridors and exclosures will facilitate removing strays and allow access for maintenance of fence and water lines, mitigation planting, and monitoring and for utility right-of-way requirements. Cross-fencing on either side of a creek crossing is typically not recommended as it will prevent wildlife and fish passage, increase debris accumulation and erosion, and is not needed when used in conjunction with low-stress movement. For the bypass project, riparian corridor fencing is required as a mitigation measure.

While not strictly a fencing issue, the new management units may, in the future, require separate gathering, sorting, and loading corrals if or when current lessees change.

E.3.1 Riparian Corridor Grazing

Riparian corridor grazing is often conducted at a high stock density for a short period of time, typically two to four days. This short duration, high intensity grazing is often called “flash grazing.” If “flash grazing” is practiced within the riparian corridor or on BM patches temporary electric fencing may be used. Riparian corridor grazing guidelines are presented in Appendix F of the GMP.

Appendix F Riparian Corridor Grazing Guidelines

Riparian mitigation under the State MMP consists of riparian habitat establishment and rehabilitation and other waters rehabilitation (California Department of Transportation 2013). Riparian corridors on the offsite mitigation parcels will be fenced to prevent routine livestock access to valley streams. Preventing livestock access to these corridors will reduce streambank erosion and sediment delivery to the stream channel, attenuate surface water pollutants, and remove any grazing pressure by livestock under existing conditions. Riparian corridors mitigation will result in an increase in riparian vegetation cover and native riparian plant species composition and diversity, improve or maintain the quantity and quality of wildlife forage, provide cover for terrestrial wildlife, and provide overhead shade and instream woody material for streams.

Mitigation actions include planting of native woody plants along riparian corridors. As mitigation plantings mature, woody plant density (i.e., trees, shrubs, and vines) may suppress vegetation that would be considered fine fuels (e.g., grasses and forbs) and preclude the need for grazing at some point following restoration. Grazing may be a beneficial means of weed control during the long-term management period (i.e., following completion and approval of the monitoring program by the resource agencies). However, grazing cannot interfere with restoration activities or affect the project mitigation program from attaining the required performance standards and maintaining the mitigation objective of establishing and rehabilitating riparian habitat.

At some point in the future grazing in the riparian corridor may be needed to control weeds, manipulate plant species composition and reduce fine fuels. Riparian corridor grazing is often conducted at a high stock density for a short period of time, typically two to four days. This short duration, high intensity grazing is often called “flash grazing.” Flash grazing of a riparian corridor segment can be a normal part of a grazing rotation in a well-managed rotational grazing system.

Flash grazing can be a beneficial practice when applied within an adaptive management process. The decision to implement a flash grazing program in the project’s riparian corridors must be made in associate with the resources agencies, as described in the following sections. The NRWQCB specifically expects the Land Manager to provide the NRWQB with a proposal for their review and approval prior to flash grazing.

F.1 Grazing Guidelines

F.1.1 Riparian Corridors

Riparian corridor grazing will be confined to the areas between the exclusion fence on the interface of riparian corridor and the wetland rehabilitation and establishment areas. Riparian corridors on the mitigation parcels are designated as Category I, II, or III corridors. The riparian corridors are further defined in the State MMP. The riparian corridor boundaries are shown in Appendices C and E of the State MMP.

F.1.2 Responsible Party

The Mendocino County Resource Conservation District (MCRCD/Land Manager) will be responsible for the decision to graze a riparian corridor. The Land Manager shall make an informed decision based on the results of annual biological and general inspections made during the long-term management period (see Chapter 11 of the State MMP).

The decision to graze a riparian corridor must only be made if the Land Manager is certain that grazing will not adversely affect the riparian corridor or the project mitigation requirements. Flash grazing can be a beneficial practice when applied within an adaptive management process. It should be noted that adaptive grazing decisions often need to be made and implemented within a day or two to be effective. It is recommended that the Land Manager develop riparian area grazing guidelines, in coordination with the appropriate regulatory agencies, in advance so, when needed, riparian area grazing can be implemented without waiting for agency review and approval of individual requests.

F.1.3 Reasons for Grazing Riparian Corridors

Riparian corridor grazing may be recommended to support one or more of the following mitigation management requirements:

- Reduce fine fuels before the late summer – fall fire season.
- Prevent the accumulation of thatch
- Weed control, as described in Chapter 4 of the GMP.
- Reduce shading of short-statured native riparian plants.
- Improve the quality of native herbaceous plants for wildlife by controlling the density and/or populations of nonnative grasses and forbs.

F.1.4 Grazing Management Actions

Riparian corridor grazing will be confined to the areas between the exclusion fence (on the interface of riparian corridor and the wetland rehabilitation and establishment areas).

At the present time it is not possible to apply standard grazing management procedures to riparian corridors because the exact location, size, and vegetative composition, condition and quantity of an area that may require grazing cannot be determined. An adaptive management decision making process will need to be developed on a site-by-site basis and will be dependent on the size of the area and the type and density of vegetation.

Because the riparian corridor grazing will be adaptively managed the GMP cannot identify access points or water sources grazing will require access points and water sources. These issue and the following basic grazing management principles should be considered when developing a grazing management strategy for each riparian corridor grazing area.

F.1.4.1 SEASON OF GRAZING

Access to most of the riparian corridors requires passage across wet meadow mitigation areas. As a result the season of grazing for riparian corridors will be dependent on the season of grazing for wet meadows.

It is recommended that riparian corridor grazing and required stream crossing occur when water levels of streams have receded or the streambeds are dry to minimize potential effects on water quality and salmonids.

F.1.5 Intensity of Grazing

Stubble height at the end of the grazing period should be at a minimum 4 to 6 inches. Shorter heights may increase bare ground, reduce filtration capacity, and provide a sediment source during periods of high water or heavy rain.

F.1.6 Duration and Frequency of Grazing

The mitigation objective for riparian corridors is to maximize riparian vegetation cover in the corridors. Riparian planting areas, as shown in Appendix C of the State MMP, range from extended segments along the streambanks to small inclusions in existing canopy. Existing and planted riparian species are expected to grow into gaps that currently do not support riparian vegetation.

The duration and frequency of grazing in a riparian corridor will be dependent on the length and width of area to be grazed and the type and density of forage. As a general condition, flash grazing should be no more than 4 consecutive days in the same segment of the corridor. If repeat treatment is needed the Land Manager should wait at least 30 days before grazing.

F.1.7 Kind and Class of Animal

Riparian corridor grazing will likely be provided by beef cattle because they are the preferred kind and class of animal for grazing the wet meadow areas on the mitigation parcels. Sheep and goats could be used for riparian corridors particularly if the riparian grazing units are narrow and small in overall area. Sheep and goats will tend to avoid low and wet areas and rarely will cause wetland or stream bank damage. However, sheep and goats may graze woody plants that are not usually grazed by cattle.

F.1.8 Stocking Rate

Determining stocking rate is a fundamental first step in grazing management planning. The stocking rate for riparian corridor grazing units will be determined on a site-by-site basis and will be dependent on the size of the area, type and density of vegetation, kind and class of animal.

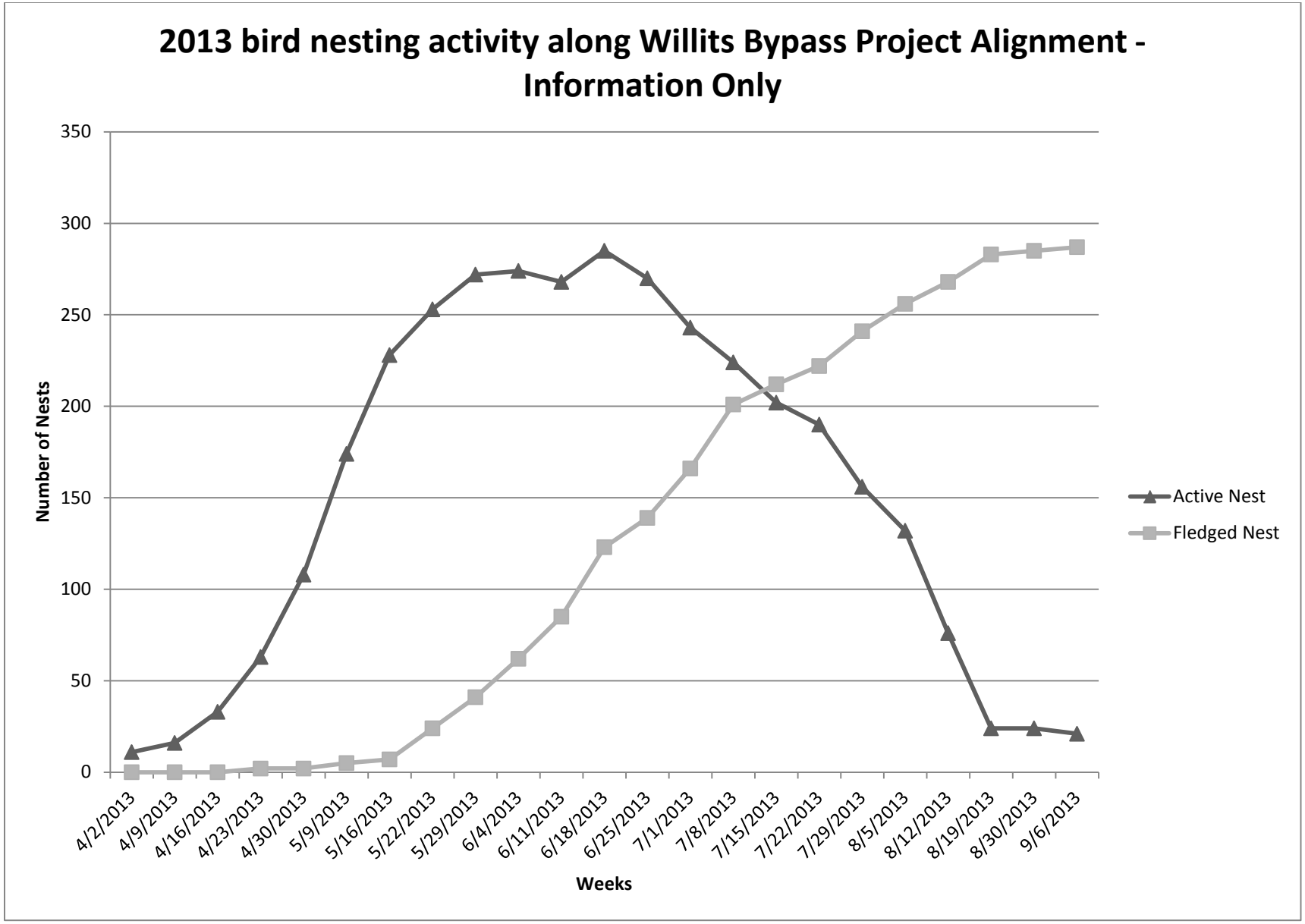
F.1.9 Infrastructure

Because the riparian corridor grazing will be adaptively managed the GMP cannot identify access points or water sources grazing will require access points and water sources. Riparian corridor fences and gates, as shown in the GMP, will be permanent therefore temporary gates or access points will need to be individually located and constructed to move livestock into each riparian grazing unit. Temporary internal cross fences may be needed to subdivide the corridors for each flash grazing period. Temporary electric fences may be used. Stock water sources will be required for each riparian corridor grazing unit if livestock are to be kept in a grazing unit for an extended period (usually no longer than 4 days). Stock water sources will need to be determined on a site-by-site basis. Temporary stock water could be provided by placing portable troughs and water could be obtaining from water lines identified in the GMP, temporary water lines, or water trucks. Riparian vegetation will provide an adequate shade source.

F.1.10 Documentation of Grazing Activities

Documentation of grazing activities in riparian corridors should be included in the adaptive management grazing plan. At a minimum the following information should be recorded for each grazing unit:

- Inform the appropriate resource agencies when grazing will commence.
- Record the reason for grazing.
- Dates of grazing (date in/date out).
- Record number of head and kind and class of animal.
- Visually estimate RDM before and after grazing.
- Photograph RDM levels before and after grazing.
- Visually inspect and photograph riparian vegetation before and after grazing.


2013 bird nesting activity along Willits Bypass Project Alignment - Information Only
Number of Nests
350
300
250
200
150
100
50
0
4/2/2013
4/9/2013
4/16/2013
4/23/2013
4/30/2013
5/9/2013
5/16/2013
5/22/2013
5/29/2013
6/4/2013
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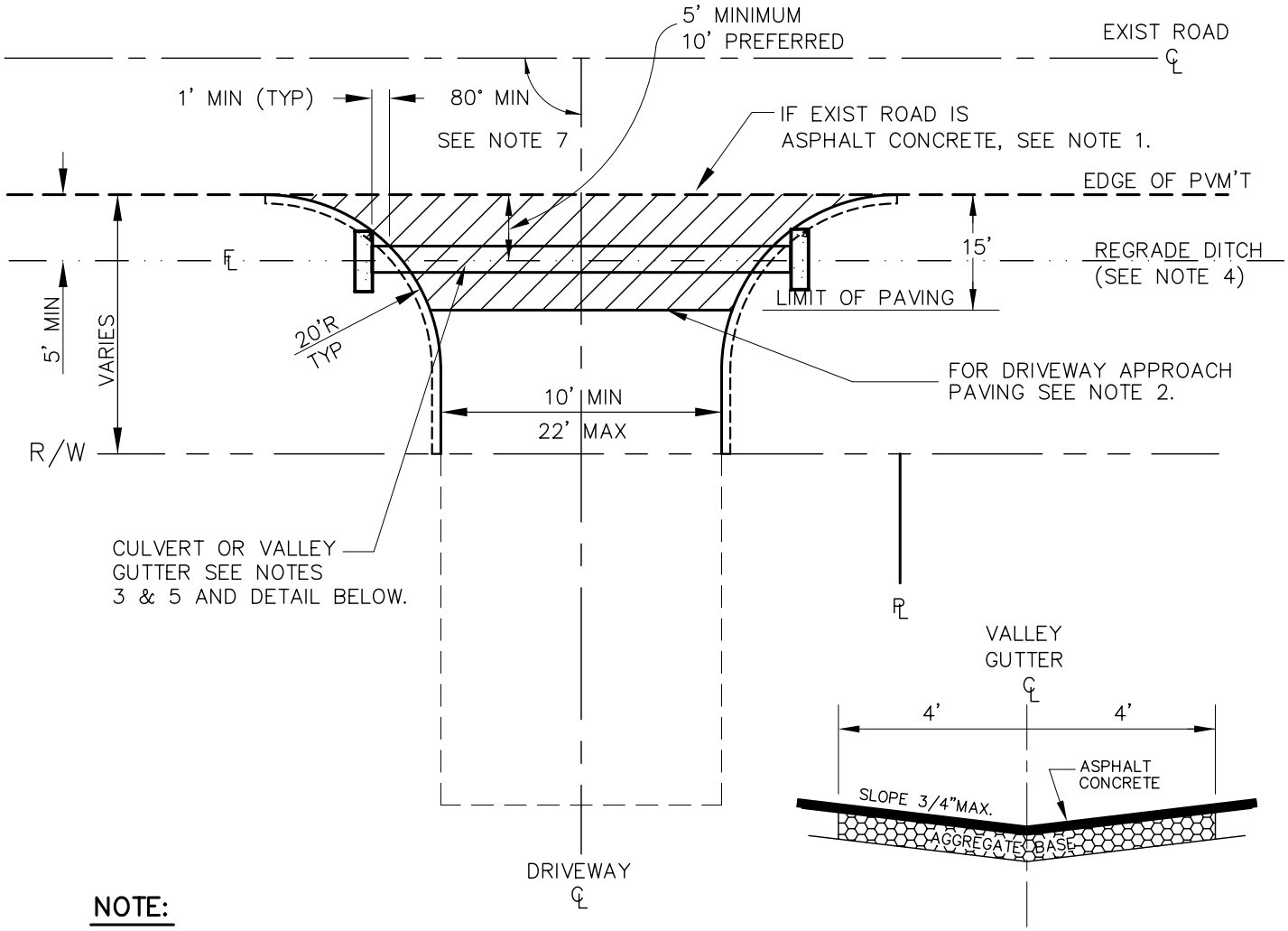
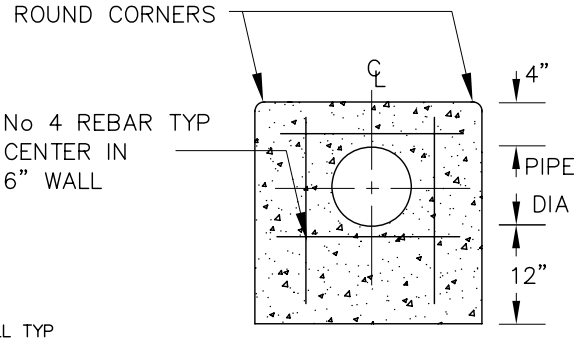
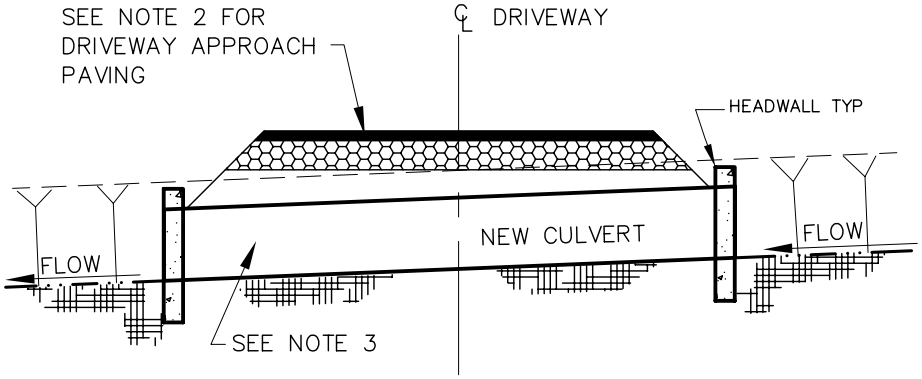
Weeks
Active Nest
Fledged Nest

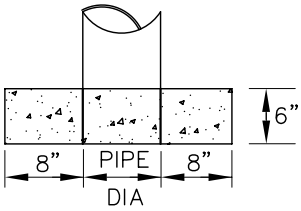


NOTE:

SEE STD. A51B FOR ALL REFERENCED NOTES.







HEADWALL

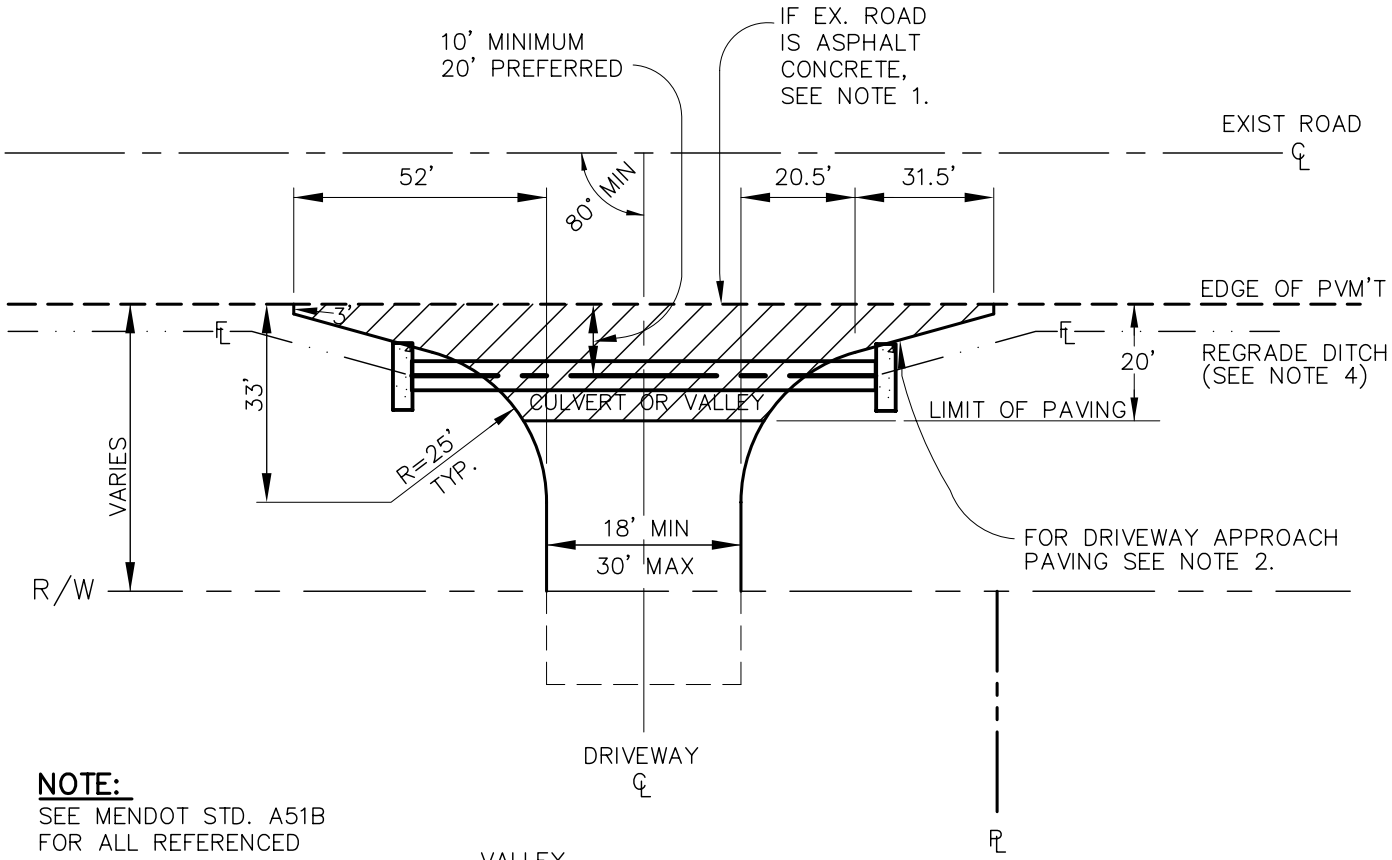
RESIDENTIAL DRIVEWAY APPROACH RURAL ROADS

MENDOT STD. NO.
A51A

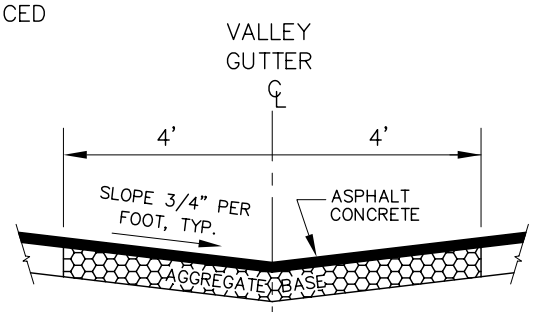
SCALE: NONE	DESIGN: HND	DRAWN: HND	FEB. 2008	PAGE: A-39

PLOT DATE: 28-AUG-00

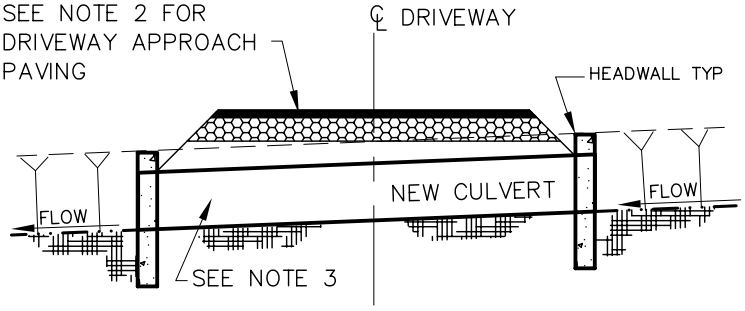
FILE: CLFS1:\LDD PROJECTS\22301\MEN-A51.DWG



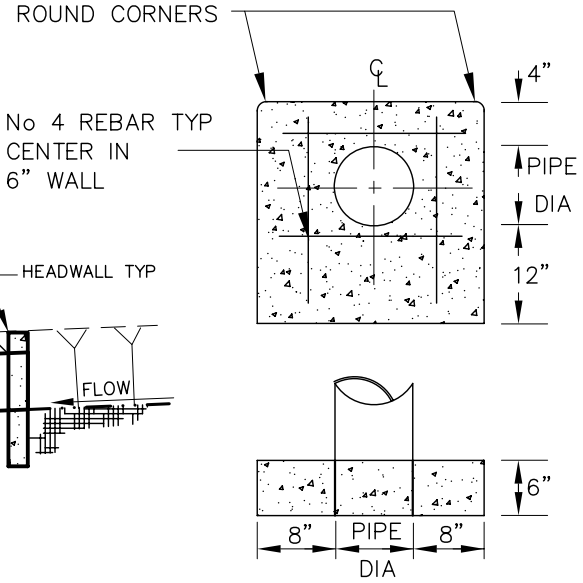
NOTE:
SEE MENDOT STD. A51B FOR ALL REFERENCED NOTES.



PAVED VALLEY GUTTER



CULVERT DETAIL



HEADWALL

MENDOCINO COUNTY	COMMERCIAL DRIVEWAY AND PRIVATE ROAD APPROACH RURAL ROADS				MENDOT STD. NO. A51B
	SCALE: NONE	DESIGN: HND	DRAWN: CLG	FEB. 2008	PAGE: A-40

PLOT DATE: 28-AUG-00

FILE: CLFS1:\LDD PROJECTS\22301\MEN-A51.DWG

PLOT DATE: 28-AUG-00

NOTES:

1. NEATLY CUT EXIST. EDGE OF PAVEMENT AND APPLY TACK COAT.
2. RESIDENTIAL DRIVEWAY APPROACH MATERIAL SHALL BE ASPHALT CONCRETE IF ROAD FRONTING DRIVEWAY IS PAVED, PAVING SHALL CONSIST OF 2" A.C. OVER 6" A.B. MINIMUM.
3. COMMERCIAL DRIVEWAY AND PRIVATE ROAD APPROACH MATERIAL SHALL BE ASPHALT CONCRETE IF ROAD FRONTING THE APPROACH IS PAVED. PAVING AHALL CONSIST OF 3" A.C. OVER 8" CL. 2 A.B. MINIMUM.
4. DRIVEWAY APPROACH SURFACING SHALL BE COMPARABLE TO THE SURFACING OF THE ADJACENT ROAD.
   AGGREGATE BASE SHALL BE ONE FOOT WIDER THAN THE PAVED WIDTH ON EACH SIDE.
5. CULVERT SHALL BE 12" DIA. MIN. R.C.P. OR HDPE PLASTIC PIPE WITH SMOOTH INTERIOR WALL CONFORMING TO CALTRANS STANDARD SPECIFICATIONS. IN NO CASE SHALL PIPE BE SMALLER THAN UP STREAM CULVERT. LENGTH OF THE CULVERT SHALL BE THAT REQUIRED TO EXTEND ONE FOOT BEYOND THE TOE OF THE DRIVEWAY FILL.
6. REGRADE DITCH ADJACENT TO PROPERTY LINE FOR ENTIRE FRONTAGE OF PROPERTY, IF REQUIRED.
7. CULVERT SHALL BE REQUIRED WHERE THERE IS A ROADSIDE DITCH, UNLESS FLOWLINE OF DITCH IS LESS THAN 3" BELOW EDGE OF PAVEMENT PROFILE. VALLEY GUTTER SHALL BE PROVIDED WHERE CULVERT IS NOT REQUIRED (SEE DETAIL ON STD. NO. A51A)
8. ALL DRIVEWAYS SHALL INTERSECT EXIST STREETS AT 80° MINIMUM, UNLESS OTHERWISE APPROVED BY THE DOT DIRECTOR.
9. SEE MENDOT STD NO. A52 FOR DRIVEWAY/ROAD CONNECTION PROFILE.
10. SEE MENDOT STD NO. A53 FOR SIGHT DISTANCE REQUIREMENTS.
11. AN ENCROACHMENT PERMIT SHALL BE OBTAINED PRIOR TO CONSTRUCTING A DRIVEWAY APPROACH ON A COUNTY ROAD.
12. CULVERT SIZE AND MATERIAL SUBJECT TO THE APPROVEL OF COUNTY

	DRIVEWAY APPROACH RURAL ROADS – NOTES				MENDOT STD. NO. A51C
	SCALE: NONE	DESIGN: HND	DRAWN: HND	FEB. 2008	PAGE: A-41

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