

Chapter 2. Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Bridge Thin Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental effects of implementing each alternative (i.e., the amount of erosion or amount of spotted owl habitat altered).

Actions Considered but Eliminated from Detailed Study _____

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The following Alternative design features were eliminated from detailed analysis for the reasons stated.

Exclusion of Helicopter Use
In response to initial public scoping comments that expressed concern for economic feasibility, an alternative that excluded helicopter use was evaluated. The District Ranger chose not to develop this alternative, and eliminated it from detailed study, as it resulted in a failure to meet the purpose and need by eliminating the option for treatment of too many units.
Exclusion of Silvicultural Treatments in Riparian Reserves
In response to initial public scoping comments that expressed concern about management activity in Riparian Reserves, an alternative that excluded silvicultural treatment within Riparian Reserves was evaluated. The District Ranger chose not to develop this alternative, and eliminated it from detailed study as it resulted in failure to meet the purpose and need to thin overly dense plantations in Riparian Reserves and accelerate restoration of late-successional habitat.
Exclusion of Silvicultural Treatments in Stands older than 80 Years
In response to initial public scoping comments that expressed concern about management activity in Stands older than 80 years, an alternative was considered that would not commercially harvest these older stands. The District Ranger chose not to fully develop this alternative because it would not address the need to conduct oak savanna restoration, which includes stands over 80 years old. However, Alternative C does exclude timber harvest in stands over 80 years old, with the exception of oak savanna restoration stands.
Alternative with No or Less Road Building
In response to initial public scoping comments that expressed concern about the impacts of new road construction and the re-opening of roads an alternative that involves no or less road construction was

evaluated. Road maintenance is the only proposed actions associated with forest system roads. No new system roads would be constructed in the proposed action alternative. Temporary road re-opening/development would be necessary to access activity units, and would not occur in riparian areas. The District Ranger chose not to develop this alternative, and eliminated it from detailed study as it resulted in failure to meet the purpose and need to restore structural diversity in stem exclusion stands to enhance wildlife, and provide a sustainable flow of timber product to the local economy.

Treatment of only Surface and Ladder Fuels

In response to initial public scoping comments that suggested the development of an alternative that would only treat surface and ladder fuels. The District Ranger chose not to develop this alternative, and eliminated it from detailed study as it resulted in failure to meet the projects purpose and need to produce a viable timber sale that will provide a sustainable supply of wood in support of the local and regional economy.

Alternatives Considered in Detail _____

Alternative A – the No Action Alternative

Alternative A assesses the current management situation of the affected environment and serves as a baseline to compare and describe the differences in effects between taking no action and implementing action alternatives to meet project objectives. Existing site specific management plans and standards and guidelines would continue to be the basis for management of the project area. Only those management activities planned and implemented under previous decisions would continue in the project area.

Many stands are overstocked; site resources are being fully utilized and inter-tree competition is intense. The effects of overstocking include decreased growth, increased rates of mortality and high risk for insect attack. High rates of mortality would increase fuel loading; this combined with ladder fuels puts these stands at high risk for a stand replacement wildfire. These conditions are not sustainable over time. Stand conditions that can favor the spread of insect and disease in proposed harvest units would continue unabated. Decline in underrepresented species, like sugar pine (*Pinus lambertiana*) and western red cedar (*Thuja plicata*), would continue.

Seral stage diversity within the stands would remain low. In the absence of treatments including timber harvest and underburning, species tolerant to regenerating and growing under thick canopies would dominant the site over time. High stocking density and canopy closure would continue to restrict regeneration of Douglas fir, sugar pine, and western red cedar. The species composition in many stands would slowly shift from being dominated by species less tolerant of shade to more tolerant species like western hemlock.

Stands that are currently at a moderate to high stand density and experiencing a declining rate of growth would continue along current growth trends. Stand conditions that can favor the spread of bark beetle and root rot in proposed harvest units would continue unabated. Additionally, in the absence of prescribed fire treatments, fuel loading (ladder fuels and canopy closure) would remain high and continue to increase. This would result in conditions that are conducive for severe and high

intensity wildfires. Fire suppression efforts would continue with the potential for larger and more dangerous wildfires to occur. Areas near structures and/or private residences would not have any reduction in fuels to aid in lessening wildfire intensity and mitigating hazards for firefighters.

Since no timber harvest would occur at this time, this alternative would not meet the purpose and need for action, including managing the project area to maintain stand health and vigor and provide multiple use benefits. Because no timber stand treatments are included in Alternative A, it would not meet the needs of restoring structural diversity in stem exclusion stands to enhance wildlife habitat; accelerating late-successional conditions for stands within riparian reserves; responding to the need to restore “open oak savannah” stands where they were historically present in the Bridge Thin project area. This alternative would also not respond to the need to reduce hazardous fuels and improve the role of fire as a natural disturbance process in the ecosystem or provide additional protection for communities in the wildland-urban interface.

The existing network of roads would remain unchanged. Normal scheduled road maintenance, such as brushing, culvert cleaning, and surface blading would continue in accordance with annual maintenance plans. Control of invasive plants would continue as currently programmed and funded.

Alternative A (No Action) as it Responds to the Significant Issues:

Water Quality/Aquatic Resources

Alternative A proposes no activities that would create new risks to soil and water resources. However, the alternative allows existing road related problems including erosion from roads currently in poor condition and barriers to aquatic passage to persist. Alternative A would also allow dense stagnant riparian stands resulting from prior regeneration harvest to persist.

Threatened Northern Spotted Owl

Alternative A proposes no activities that would change current trends of development of long-term sustainable habitat for the threatened spotted owl in the project area.

Alternative B – The Proposed Action

Alternative B would respond to the purpose and need by implementing timber harvest on 2,256 acres for a gross estimate of 47.8 million board feet (MMBF) of Forest products. This alternative is consistent with management direction set forth in the Willamette National Forest Plan. Figures 5 and 6 display the activity units in the project area. Table 2 presents the types of treatment for each unit in this alternative.

Alternative B – The Proposed Action
• Harvest - 2,256 acres
• Underburn - 1,266 acres
• Fuel thin - 142 acres
• Natural fuels underburn - 51 acres
• Grapple pile and burn - 397 acres
• Hand pile and burn - 264 acres

- Maintain existing system roads - 34.2 miles
- Re-open temporary spur roads (would be closed after use) - 1.8 miles
- Construct temporary spur roads (would be closed after use) - 3 miles

Vegetation

Harvest treatments include 145 acres of riparian thin, 391 acres of moderate thin, 1,368 acres of heavy thin, 30 acres of oak thin, and 190 acres of wildlife thin. Group selects (gaps) would be cut in stands to create holes to develop early seral habitat. Gaps would be placed within units: 2, 3, 8, 10, 20, 40, 42, 43, 44, 45, 46, and 68. Stand conditions and silvicultural prescriptions for the units in this alternative can be found on pages 66-84.

Alternative B would provide for underrepresented species, for example sugar pine and western redcedar. Natural regeneration opportunities in older stands with harvest (units 80, 81, 82, 83, 84, 841, 85, 88, and 91) would be increased by opening up the stand. sugar pine, a relatively shade intolerant species, has been shown to increase seed-to-seedling success from a ratio of (1:244 to 1:483) to (1:70) with disturbance under the seed trees (Fowells, et al).

Alternative B would implement harvest with approximately 770 acres of ground based yarding, 960 acres using skyline yarding systems, and 520 acres of helicopter yarding. This alternative allows for eight helicopter landings. The clearing for each landing would be approximately 0.5 acres in size.

Table 2. Alternative B Harvest Units.

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
1	14	HT-13, NT-1	M1	Heli	___	496	940	HP
2	140	HT-78, RT-48, NT-14	M1	Skyline: 15 Ground: 115 Heli: 10	2909	3,170	6,014	GP/HP
3	47	HT-47	M1	Ground	___	1,343	2,547	GP
4	57	HT-55, NT-2	M1	Ground: 19 Heli: 38	___	914	1,734	GP/HP
5	73	HT-69, NT-4	M1	Ground: 54 Heli: 19	1287	1,710	3,244	UB ¹ /GP/H P
6	87	HT-76, RT-7, NT-4	M1	Skyline: 48 Ground: 22 Heli: 17	643	2,178	4,132	UB ¹ /GP/H P
8	60	HT-54, RT-5, NT-1	M1	Ground	1099	934	1,771	GP
10	37	HT-36, NT-1	M1	Ground	1077	367	696	UB
11	37	HT-30, NT-7	M1	Skyline	___	478	907	HP
12	21	HT-14, NT-7	M1	Skyline	___	177	337	HP
13	21	HT-16, RT-3, NT-2	M1	Heli	___	385	731	HP
14	27	HT-27	M1	Heli	___	664	1,259	HP

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
15	79	HT-59, RT-12, NT-8	M1	Heli	1568	1,994	3,783	HP
17	24	HT-18, RT-4, NT-2	M1	Heli	___	282	534	HP
18	27	HT-24, RT-2, NT-1	M1	Heli	___	278	527	HP
20	66	MT-66	M1	Ground	832	1,161	2,202	UB
21	12	MT-9, NT-3	M1	Ground	737	49	93	GP
23	12	MT-11, NT-1	M1	Ground	___	118	224	GP
24	5	MT-5	M1	Ground	___	32	61	HP
25	26	HT-26	M1	Skyline	___	789	1,496	HP
26	14	MT-14	M1	Ground: 11 Heli: 3	___	342	648	UB
27	5	HT-5	M1	Skyline	___	84	159	UB
28	7	HT-5 RT-1, NT-1	M1	Skyline: 2 Ground: 5	___	282	534	GP/HP
29	47	HT-45, RT-1, NT-1	M1	Ground: 6 Heli: 41	___	827	1,568	UB ¹ /GP/H P
30	38	HT-38	M1	Ground: 9 Heli: 29	829	1,173	2,225	GP/HP
31	19	HT-19	M1	Skyline: 1 Heli: 18	___	344	652	UB ¹ /HP
32	123	MT-123	M1	Skyline	5141	1,787	3,390	UB
34	5	MT-5	M1	Skyline	___	95	180	UB
35	54	HT-54	M1	Skyline: 48 Ground: 6	1393	1,136	2,154	GP/HP
36	36	HT-34, NT-2	M1	Skyline	1146	827	1,569	HP
37	43	HT-39, RT-4	M1	Skyline	345	782	1,482	HP
38	27	HT-27	M1	Skyline	___	525	997	UB
39	20	HT-20	M1	Skyline: 18 Ground: 2	341	373	708	UB ¹ /HP
40	27	WT-14, RT-11, NT-2	M1	Skyline: 5 Ground: 22	___	837	1,588	UB
42	32	WT-32	M1	Skyline	___	412	781	UB
43	44	WT-26, RT-11, NT-7	M1	Skyline: 5 Ground: 39	625	1,379	2,616	UB ¹ /GP/H P
44	45	WT-41, RT-2, NT-2	M1	Ground	___	1,512	2,867	GP
45	38	WT-26, RT-9, NT-3	M1	Skyline: 21 Ground: 17	802	864	1,640	GP/HP
46	41	HT-41	M1	Skyline: 36 Ground: 5	857	476	904	UB ¹ /GP/H P
47	32	HT-26, RT-3,	M1	Skyline	___	720	1,365	HP

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
		NT-3						
48	17	HT-17	M1	Ground	___	370	702	GP
49	7	HT-4, RT-2, NT-1	M1	Ground	___	119	227	GP
50	6	___	M1	___	___	___	___	FT
51	20	HT-18, NT-2	M1	Skyline	___	501	950	HP
52	11	HT-11	M1	Skyline	114	205	388	UB ¹ /HP
53	3	HT-3	M1	Skyline	___	32	61	UB
54	10	HT-10	M1	Ground	___	307	581	GP
55	25	HT-24, NT-1	M1	Skyline	473	659	1,251	UB ¹ /HP
56	44	HT-41, NT-3	M1	Heli	___	2,074	3,935	UB
57	15	HT-15	M1	Heli	___	654	1,241	UB
58	16	MT-16	M1	Skyline	___	140	266	UB ¹ /HP
59	22	HT-22	M1	Skyline: 16 Heli: 6	___	1,126	2,135	UB
60	24	MT-23, NT-1	M1	Skyline: 14 Ground: 10	762	189	359	UB
61	16	HT-12, RT-4	M1	Ground	___	426	809	UB ¹ /GP
62	19	MT-19	M1	Ground	801	123	233	UB
63	29	HT-29	M1	Skyline: 14 Heli: 15	___	798	1,514	HP
64	42	MT-41, NT-1	M1	Skyline: 36 Ground: 6	1346	548	1,040	GP/HP
65	10	MT-10	M1	Skyline	___	178	337	HP
66	11	MT-10, NT-1	M1	Skyline: 1 Ground: 10	___	116	220	UB
67	22	MT-22	M1	Ground	___	296	561	UB
68	41	WT-41	M1	Skyline: 31 Ground: 10	___	542	1,028	UB
69	33	HT-32, NT-1	M1	Skyline: 18 Ground: 15	___	1,109	2,103	UB ¹ /GP/H P
70	3	MT-3	M1	Skyline	395	15	28	UB
72	28	HT-27, NT-1	M1	Skyline: 20 Ground: 8	___	123	233	UB
80	10	WT-10	M2	Skyline	___	650	1,232	UB
81	14	MT-14	M2	Skyline	___	579	1,099	UB
82	35	HT-17, NT-18	M2	Skyline	___	479	909	UB
83	17	HT-11, NT-6	M2	Skyline	___	244	462	UB
84	32	OT-19, RT-8, NT-5	M2	Skyline: 24 Heli: 8	___	1,002	1,901	UB
841	26	HT-22, NT-4	M2	Skyline	___	521	988	UB

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
85	12	OT-11, NT-1	M2	Heli	___	33	63	UB
86	7	___	M2	___	___	___	___	NFUB
87	2	___	M2	___	___	___	___	NFUB
88	36	HT-23, RT-8, NT-5	M2	Skyline: 9 Ground: 27	___	854	1,621	UB
89	6	___	M2	___	___	___	___	FT
91	38	HT-35, NT-3	M2	Skyline: 19 Heli: 19	___	244	462	UB
95	27	___	M2	___	___	___	___	FT
96	10	___	M2	___	___	___	___	FT
97	5	___	M2	___	___	___	___	FT
98	4	___	M2	___	___	___	___	FT
99	13	___	M2	___	___	___	___	FT
100	42	___	M2	___	___	___	___	NFUB
101	12	___	M2	___	___	___	___	FT
102	33	___	M2	___	___	___	___	FT
103	26	___	M2	___	___	___	___	FT
Totals	2,449	2,256	___	___	25,552	47,758	90,391	___

Fuels Treatment

All units in Alternative B would receive fuel treatments to reduce logging slash and return the disturbance process of fire to the ecosystem. Treatments include underburning (UB) harvest activity fuels under a residual overstory, and the piling and burning of landing, hand piles (HP), or grapple/machine piles (GP). See Table 2 for stand treatment by unit.

All units with harvest activities would have landing piles burned following harvest. Units with hand piling treatments would be focused along the roadsides up to 100 ft. into the unit or areas of concentrations within the unit. Hand piling would make roads more effective as fuel breaks for

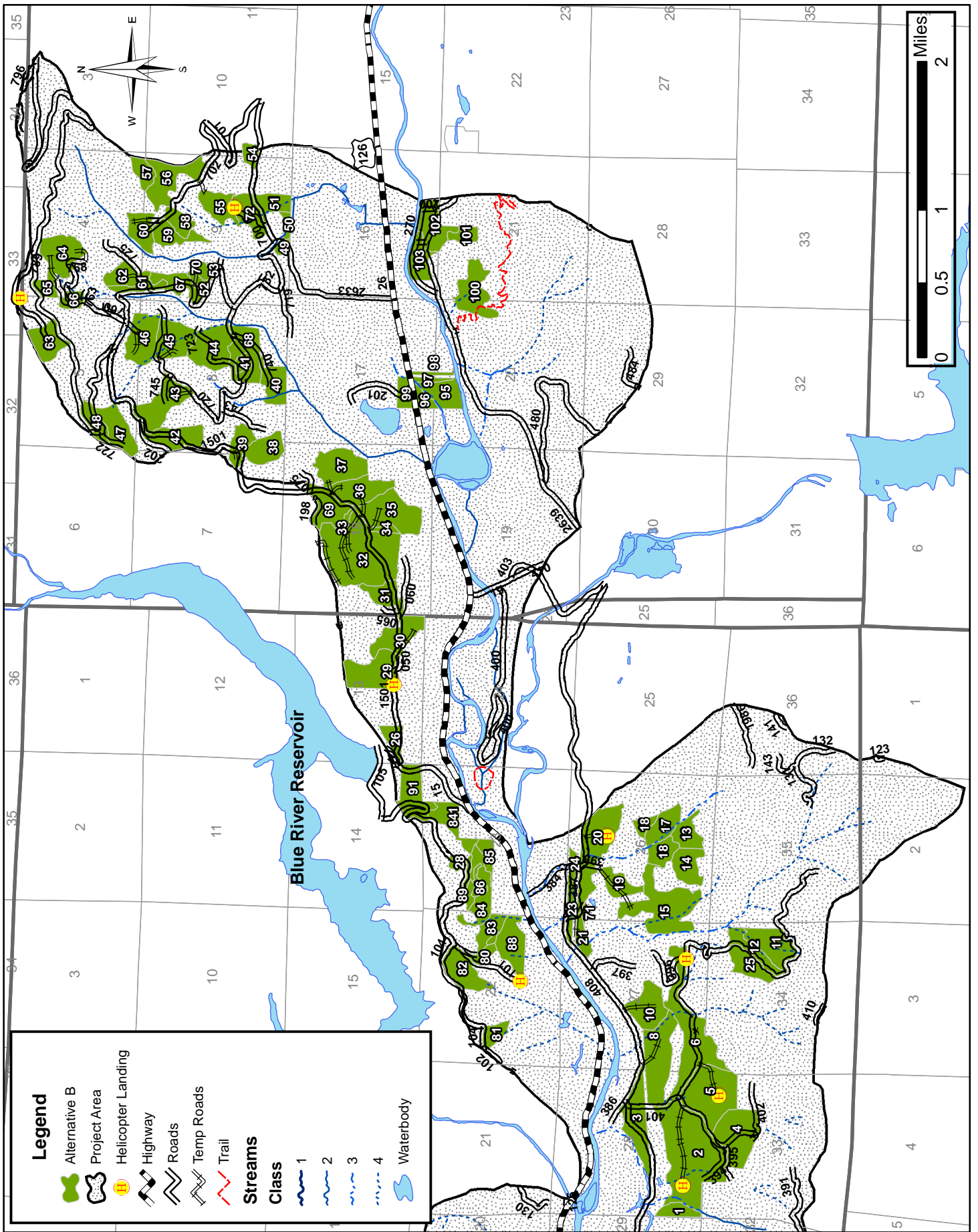


Figure 5. Bridge Thin Project Area - Alternative B (Eastern Section).

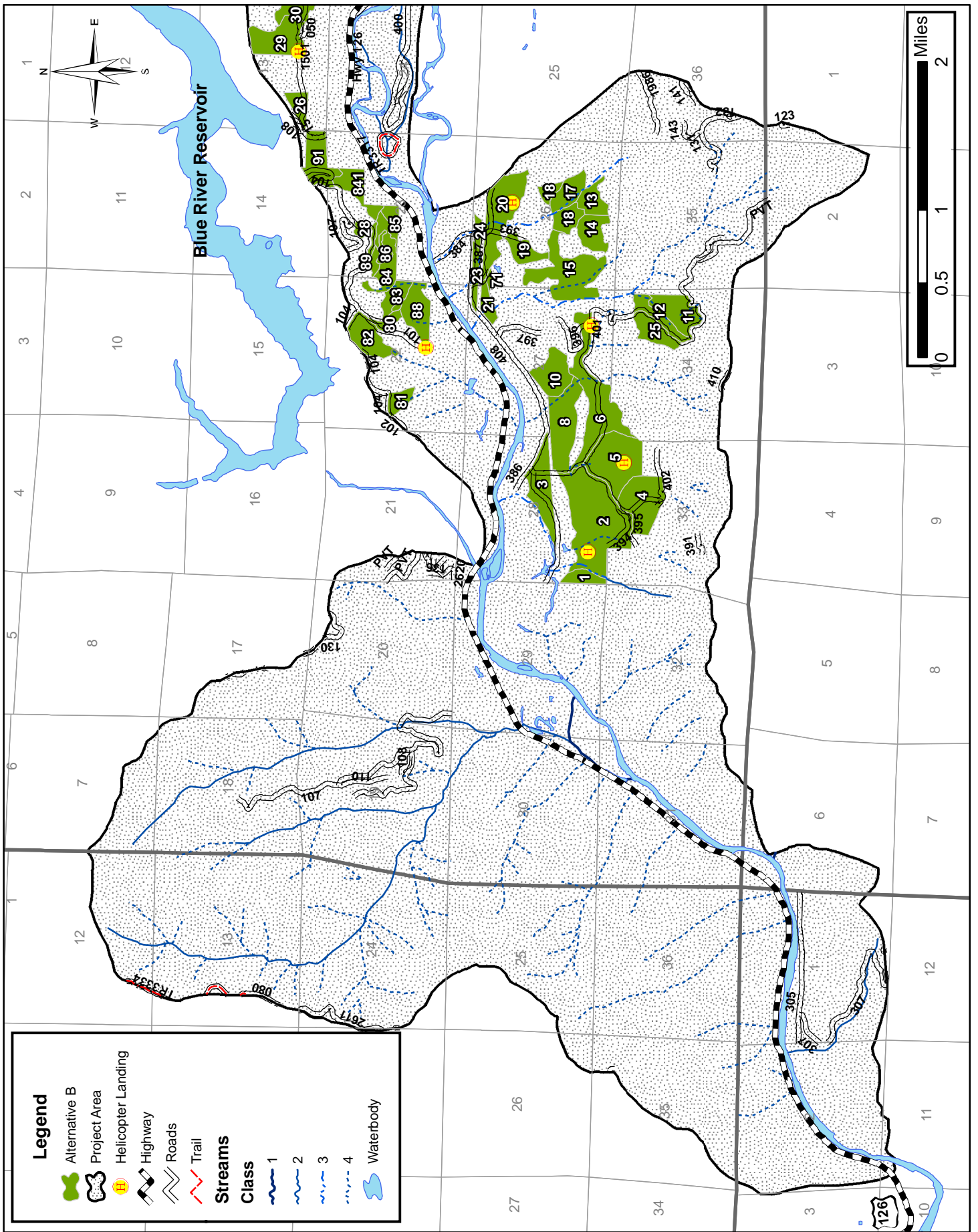


Figure 6. Bridge Thin Project Area - Alternative B (Western Section).

wildfire suppression. Pile burning of landings, hand piles, and grapple/machine piles should take place in the fall or winter season when fire should not spread outside of the piles. Alternative biomass utilization would occur if a market exists for wood fiber or firewood.

Prescribed fire to treat logging slash would take place during the spring season, or when weather and fuels are in spring-like conditions. Spring-like conditions are defined as:

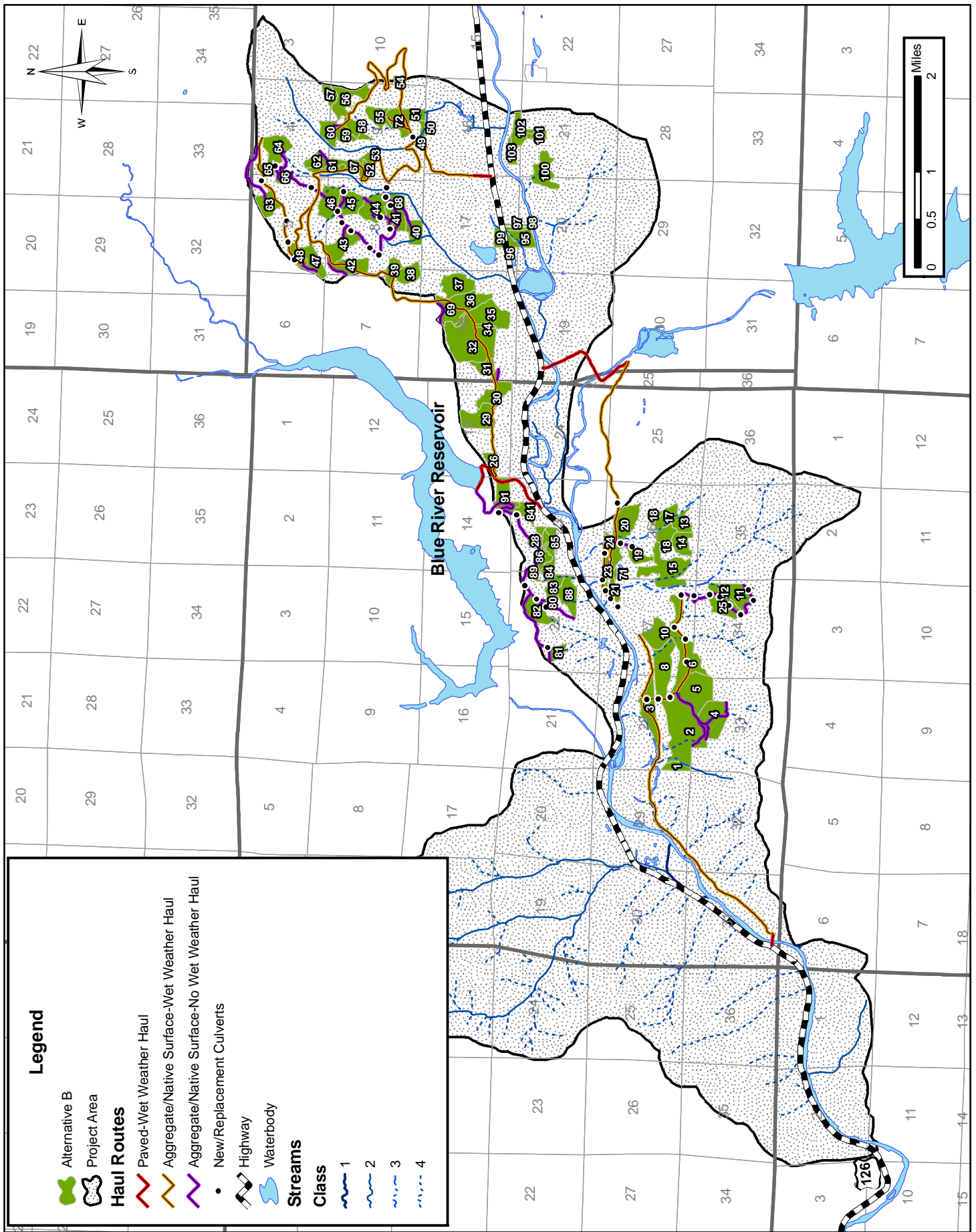
Spring-like conditions are defined as:
• Fuels $\geq 3''$ in diameter (1,000 hour fuels) have fuel moistures of 25% or greater,
• Soil moistures and duff moistures are damp, at levels where duff consumption could be limited to 30-40% across the unit, and
• When mortality of overstory trees would be low.

Fuels thins (FT) are non-commercial harvests that would occur in Units 50, 89, 95-99, 101-103 (See Table 2). Fuels thins would involve reducing the brush and trees $< 7''$ DBH throughout the unit. This would reduce the ladder fuels and the understory density that increase the potential for high intensity wildfires. Fuels may be treated in different ways depending on efficiency and funding. Units could be cut by hand, followed by hand piling and burning or the units may be processed with a machine that would grapple pile or chip/mulch the fuels. The treatment of mulching/chipping would change the fuel loading to a more compact profile, thus reducing lofty and flammable fuels to a less hazardous profile. The fuels thins would reduce the ladder fuels and the horizontal and vertical continuity of the vegetation. Reducing these fuels help create part of the defensible space next to structures or private land and along the highway where burning rubbish thrown from cars can ignite wildfires.

The proposed treatment of Unit 100 would be a natural fuels underburn. This unit is along King Road next to private land. Due to the location the underburn, it can be completed safely with predominant winds blowing uphill and away from structures. A natural fuels underburn would provide a reduction in the hazardous fuels by reducing 1, 10, and part of the 100 hours fuels on the ground, and in the ladder fuels and canopy cover. Mortality in these stands would be around 20% or less. Underburning is a preferred method of treatment not only to reduce hazardous fuels but to return fire to the ecosystem. Units 86 and 87 are also proposed for natural fuels underburns. The units would be burned in conjunction with the bordering units; they would not be underburned individually.

Roads

For Alternative B, approximately 33.6 miles of existing forest roads would be maintained to allow access to harvest areas for timber haul (See Figure 7) and to reduce adverse impacts to resources., and another 0.6 mile of road would receive spot rocking and other road maintenance to support rock haul, for a total of 34.2 miles of road maintenance. Road maintenance activities would include felling danger trees, clearing and grubbing, replacing drainage structures, removing slides, repairing holes in the roadbed, reconstructing ditches, and placement of aggregate surfacing. Forty-two new/replacement culverts would be installed as part of road maintenance activites (see Figure_). This



includes stream crossing replacements listed in Table 3. The stream crossing culvert replacement projects listed in Table 3 would occur on existing roads designated for haul in this project. All stream-crossing improvements would accommodate 100-year flood events.

Table 3. Stream Crossing Culvert Replacement.

Road Number	Existing Condition	Proposed Treatment	Description of Associated Maintenance Activities
2633-720	Closed	Reconstruction	Redesign Mill Creek crossing to pass 100 year peak flows, and allow aquatic wildlife passage.
1900-408	Open	Reconstruction	Redesign unnamed creek crossings to protect water quality.

Existing open roads would be reduced by a total of 0.2 miles with gate or berm closure. Additionally, 0.3 miles of existing closed roads would be decommissioned (see Soils, Watershed, and Fisheries protection Mitigation #16 for description).

Alternative B would also construct about 16,000 feet of new temporary roads and utilize 9,500 feet of unclassified roads to allow access to harvest. Upon completion of sale activities, the temporary roads would be decommissioned.

Table 4. Roads Decommissioning for Alternative B.

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Treatment Activities	Miles Affected
1500-100	Open	Close	Berm entrance	0.2
2633-723	Closed	Decommission, end of road only	Remove culvert and fill at MP 0.6, outslope and install waterbars to end of road at MP 0.7	0.1
2633-761	Closed	Decommission road east of creek	Berm entrance, maintain drainage *	0.1
2633-763	Closed	Decommission road east of creek	Berm entrance, maintain drainage *	0.1
Total				0.5

* Some segments are presently in stable condition and may not require physical treatment to stabilize before re-classifying to “decommissioned.”

Alternatives B as it Responds to the Significant Issues:

Water Quality/Aquatic Resources

Alternative B includes 19 specific Best Management Practices (BMPs) that provide for the protection of soil, water, and fisheries resources, as required project mitigation. The riparian reserve thinning strategy also provides for the retention of effective stream shading vegetation and adequate levels of large wood in riparian reserves that occur in proposed partial cutting units. Silvicultural and fuels treatments within riparian reserves are prescribed at distances sufficient to maintain or improve aquatic habitat condition.

Alternative B proposes to thin 145 acres of riparian reserve and prescribed fire treatment in thinned riparian reserve areas. These activities are expected to create stand conditions that favor the accelerated development of future large wood and other late successional stand characteristics. This alternative would provide greater immediate diversity of patches and openings compared to the no action alternative, and would create conditions that result in greater plant species richness in thinned portions of riparian reserves.

Alternative B replaces existing drainage features (aged culverts and resized culvert diameters to accommodate 100-year flood flows) and proposes additional drainage structures (ditch relief culverts) that benefit aquatic species habitat downstream of project area roads. It includes road maintenance and reconstruction on 34.2 miles of road. This alternative also closes 0.2 miles of currently open roads. Approximately 0.3 miles of currently unneeded roads would also be decommissioned.

Threatened Northern Spotted Owl

All owl sites at risk from disturbance are protected through seasonal restrictions, which are listed under Wildlife Mitigation Measure #4. No occupied breeding habitat is altered under this alternative. Effects to non-breeding habitat are in compliance with standards and guidelines from the Willamette Forest Plan and U.S. Fish and Wildlife Service guidance. High quality nesting habitat would be protected. Dispersal habitat would be removed within 7 spotted owl home ranges, for a total of 228 acres. Dispersal habitat would be thinned on approximately 1856 acres, yet would maintain a 40% canopy cover and therefore, will continue to function as dispersal habitat.

Alternative C

Alternative C would respond to the project purpose and needs, while avoiding timber harvest in stands 80 years or older (140 acres), with the exception of the oak savannah restoration stands. Alternative C would implement timber harvest on 2,080 acres for a gross estimate of 44.2 million board feet (MMBF) of Forest products. This alternative is consistent with management direction set forth in the Willamette National Forest Plan. Figures 8 and 9 display the Alternative C activity units within the Bridge Thin Project area. Table 5 presents the types of treatment for each unit in this alternative.

Alternative C
• Harvest - 2,080 acres
• Underburn - 1,133 acres
• Fuel thin - 142 acres
• Natural fuels underburn – 49 acres
• Grapple pile and burn - 397 acres
• Hand pile and burn - 264 acres
• Maintain existing system roads - 33.7 miles
• Re-open of temporary spur roads (would be closed after use) - 1.8 miles
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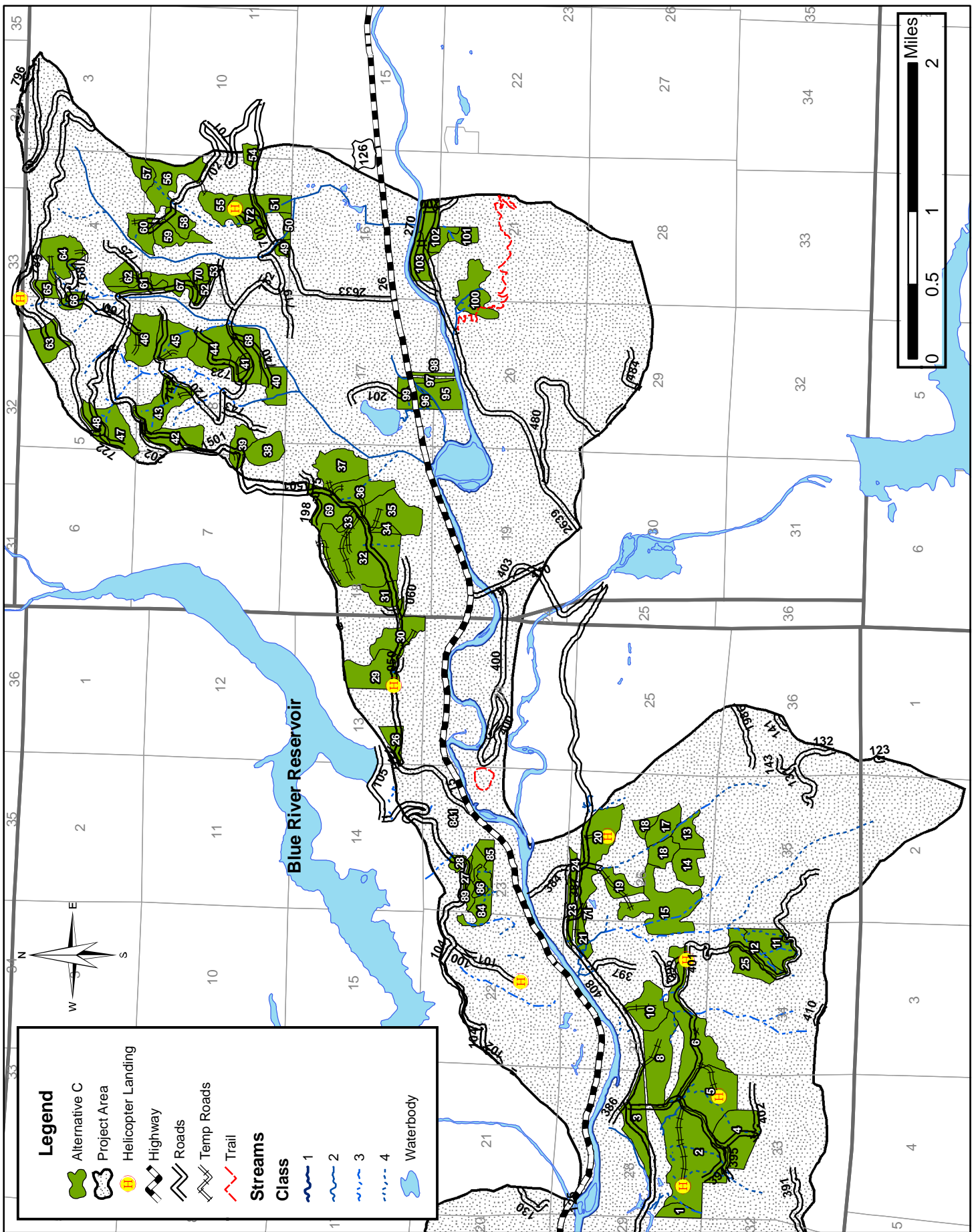


Figure 8. Bridge Thin Project Area - Alternative C (Eastern Section).

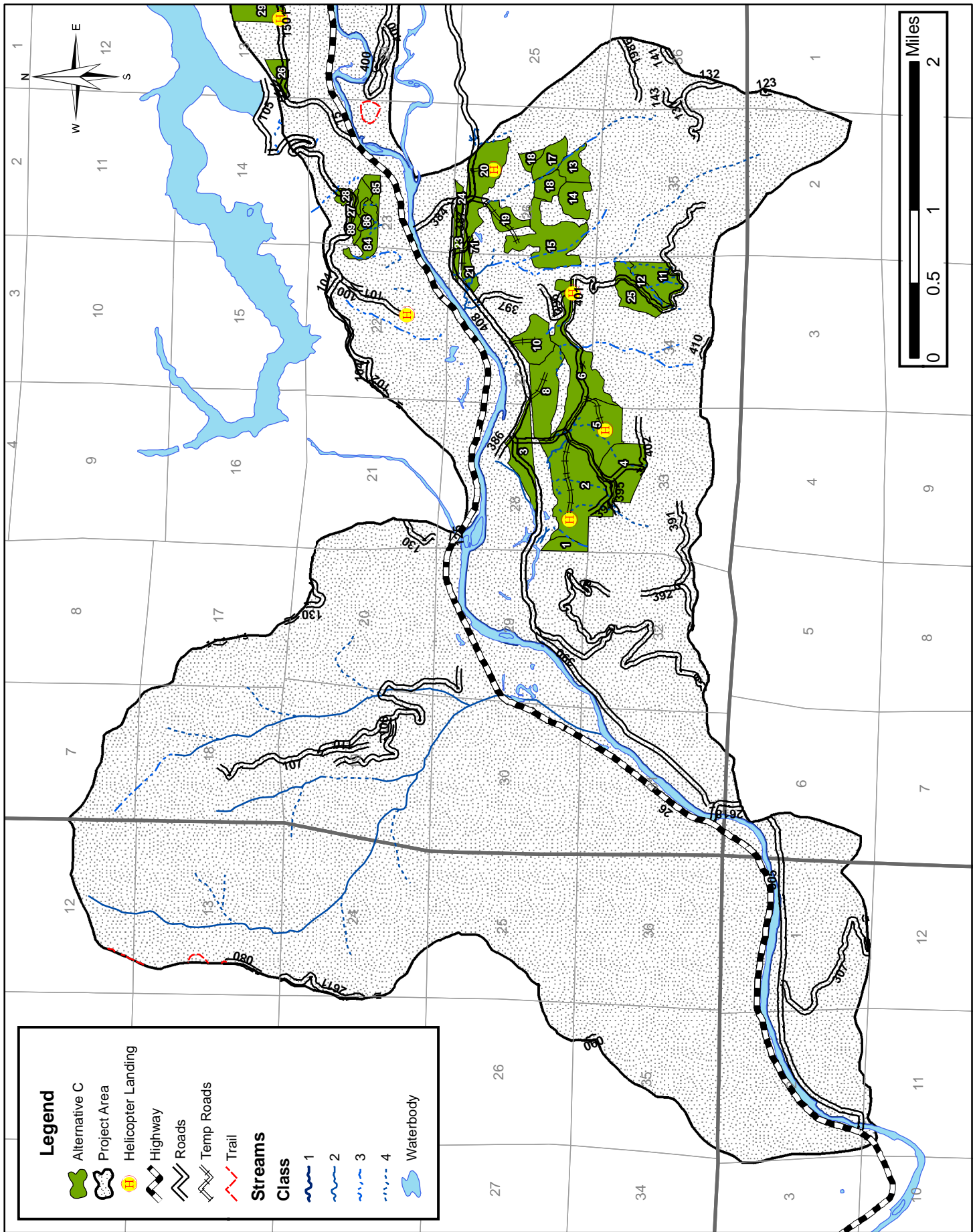


Figure 9. Bridge Thin Project Area - Alternative C (Western Section).

Vegetation

Harvest treatments include 137 acres of riparian thin, 377 acres of moderate thin, 1,260 acres of heavy thin, 30 acres of oak thin, and 180 acres of wildlife thin. Group selects (gaps) would be cut in stands to create holes to develop early seral habitat. Gaps would be placed within units: 2, 3, 8, 10, 20, 40, 42, 43, 44, 45, 46, and 68. Stand conditions and silvicultural prescriptions for the units in this alternative can be found on pages 66-84

Alternative C would implement harvest with approximately 760 acres of ground based yarding, 830 acres using skyline yarding systems, and 500 acres of helicopter yarding. This alternative allows for eight helicopter landings. The clearing for each landing would be approximately 0.5 acres in size.

Table 5. Alternative C Harvest Units.

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
1	14	HT-13, NT-1	M1	Heli	—	496	940	HP
2	140	HT-78, RT-48, NT-14	M1	Skyline:1 5 Ground: 115 Heli: 10	2909	3,170	6,014	GP/HP
3	47	HT-47	M1	Ground	—	1,343	2,547	GP
4	57	HT-55, NT-2	M1	Ground: 19 Heli: 38	—	914	1,734	GP/HP
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20	66	MT-66	M1	Ground	832	1,161	2,202	UB
21	12	MT-9, NT-3	M1	Ground	737	49	93	GP

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
23	12	MT-11, NT-1	M1	Ground	___	118	224	GP
24	5	MT-5	M1	Ground	___	32	61	HP
25	26	HT-26	M1	Skyline	___	789	1,496	HP
26	14	MT-14	M1	Ground: 11 Heli: 3	___	342	648	UB
27	5	HT-5	M1	Skyline	___	84	159	UB
28	7	HT-5 RT-1, NT-1	M1	Skyline: 2 Ground: 5	___	282	534	GP/HP
29	47	HT-45, RT-1, NT-1	M1	Ground: 6 Heli: 41	___	827	1,568	UB ¹ /GP/H P
30	38	HT-38	M1	Ground: 9 Heli: 29	829	1,173	2,225	GP/HP
31	19	HT-19	M1	Skyline: 1 Heli: 18	___	344	652	UB ¹ /HP
32	123	MT-123	M1	Skyline	5141	1,787	3,390	UB
34	5	MT-5	M1	Skyline	___	95	180	UB
35	54	HT-54	M1	Skyline: 48 Ground: 6	1393	1,136	2,154	GP/HP
36	36	HT-34, NT-2	M1	Skyline	1146	827	1,569	HP
37	43	HT-39, RT-4	M1	Skyline	345	782	1,482	HP
38	27	HT-27	M1	Skyline	___	525	997	UB
39	20	HT-20	M1	Skyline: 18 Ground: 2	341	373	708	UB ¹ /HP
40	27	WT-14, RT-11, NT-2	M1	Skyline: 5 Ground: 22	___	837	1,588	UB
42	32	WT-32	M1	Skyline	___	412	781	UB
43	44	WT-26, RT-11, NT-7	M1	Skyline: 5 Ground: 39	625	1,379	2,616	UB ¹ /GP/H P
44	45	WT-41, RT-2, NT-2	M1	Ground	___	1,512	2,867	GP
45	38	WT-26, RT-9, NT-3	M1	Skyline: 21 Ground 17	802	864	1,640	GP/HP
46	41	HT-41	M1	Skyline: 36 Ground: 5	857	476	904	UB ¹ /GP/H P
47	32	HT-26, RT-3, NT-3	M1	Skyline	___	720	1,365	HP
48	17	HT-17	M1	Ground	___	370	702	GP
49	7	HT-4, RT-2, NT-1	M1	Ground	___	119	227	GP
50	6	___	M1	___	___	___	___	FT
51	20	HT-18, NT-2	M1	Skyline	___	501	950	HP
52	11	HT-11	M1	Skyline	114	205	388	UB ¹ /HP

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
53	3	HT-3	M1	Skyline	___	32	61	UB
54	10	HT-10	M1	Ground	___	307	581	GP
55	25	HT-24, NT-1	M1	Skyline	473	659	1,251	UB ¹ /HP
56	44	HT-41, NT-3	M1	Heli	___	2,074	3,935	UB
57	15	HT-15	M1	Heli	___	654	1,241	UB
58	16	MT-16	M1	Skyline	___	140	266	UB ¹ /HP
59	22	HT-22	M1	Skyline: 16 Heli: 6	___	1,126	2,135	UB
60	24	MT-23, NT-1	M1	Skyline: 14 Ground: 10	762	189	359	UB
61	16	HT-12, RT-4	M1	Ground	___	426	809	UB ¹ /GP
62	19	MT-19	M1	Ground	801	123	233	UB
63	29	HT-29	M1	Skyline: 14 Heli: 15	___	798	1,514	HP
64	42	MT-41, NT-1	M1	Skyline: 36 Ground: 6	1346	548	1,040	GP/HP
65	10	MT-10	M1	Skyline	___	178	337	HP
66	11	MT-10, NT-1	M1	Skyline: 1 Ground: 10	___	116	220	UB
67	22	MT-22	M1	Ground	___	296	561	UB
68	41	WT-41	M1	Skyline: 31 Ground: 10	___	542	1,028	UB
69	33	HT-32, NT-1	M1	Skyline: 18 Ground: 15	___	1,109	2,103	UB ¹ /GP/H P
70	3	MT-3	M1	Skyline	395	15	28	UB
72	28	HT-27, NT-1	M1	Skyline: 20 Ground: 8	___	123	233	UB
84	32	OT-19, RT-8, NT-5	M2	Skyline: 24 Heli: 8	___	1,002	1,901	UB
85	12	OT-11, NT-1	M2	Heli	___	33	63	UB
86	7	___	M2	___	___	___	___	NFUB
89	6	___	M2	___	___	___	___	FT
95	27	___	M2	___	___	___	___	FT
96	10	___	M2	___	___	___	___	FT
97	5	___	M2	___	___	___	___	FT
98	4	___	M2	___	___	___	___	FT
99	13	___	M2	___	___	___	___	FT

Unit	Acres	Harvest Prescription ¹ (acres)	Stand History ² (acres)	Logging Systems (acres)	Temp Roads (feet)	Gross Estimated Timber Volume (MBF / CCF)		Fuels Treatment ⁴
100	42	___	M2	___	___	___	___	NFUB
101	12	___	M2	___	___	___	___	FT
102	33	___	M2	___	___	___	___	FT
103	26	___	M2	___	___	___	___	FT
Totals	2,271	2,080	___	___	25,552	44,187	83,618	___

Fuels Treatment

All units in Alternative C would receive fuel treatments to reduce logging slash and return the disturbance process of fire to the ecosystem. Treatments include underburning (UB) harvest activity fuels under a residual overstory, and the piling and burning of landing, hand piles (HP), or grapple/machine piles (GP). See Table 4 for stand treatment by unit.

All units with harvest activities would have landing piles burned following harvest. Units with hand piling treatments would be focused along the roadsides up to 100 ft. into the unit or areas within the unit. Hand piling would make roads more effective as fuel breaks for wildfire suppression. Pile burning of landings, hand piles, and grapple/machine piles should take place in the fall or winter season when fire should not spread outside of the piles. Alternative biomass utilization would occur if a market exists for wood fiber or firewood.

Prescribed fire to treat logging slash would take place during the spring-like season, or when weather and fuels are in spring-like conditions.

Spring-like conditions are defined as:
• Fuels $\geq 3''$ in diameter (1,000 hour fuels) have fuel moistures of 25% or greater,
• Soil moistures and duff moistures are damp, at levels where duff consumption could be limited to 30-40% across the unit, and
• When mortality of overstory trees would be low.

Fuels thins (FT) are non-commercial harvests that would occur in Units 50, 89, 95-99, and 101-103 (See Table 5). Fuels thins would involve reducing the brush and trees $< 7''$ DBH throughout the unit. This would reduce the ladder fuels and the understory density that increase the potential for high intensity wildfires. Fuels may be treated in different ways depending on the feasibility and funding. Units could be cut by hand, followed by hand piling and burning or the units may be processed with a machine that would grapple pile or chip/mulch the fuels. The treatment of mulching/chipping would change the fuel loading to a more compact profile, thus reducing lofty and flammable fuels to a less hazardous profile. The fuels thins would reduce the ladder fuels and the horizontal and vertical continuity of the vegetation. Reducing these fuels help create part of the defensible space next to structures or private land and along the highway where burning rubbish thrown from cars can ignite wildfires.

The proposed treatment of Unit 100 would be a natural fuels underburn or fuels thin. This unit is along King Road, next to private land, and due to the location the underburn can be completed safely with predominant winds blowing uphill and away from structures. A natural fuels underburn would provide a reduction in the hazardous fuels by reducing 1, 10, and part of the 100 hours fuels on the ground, the ladder fuels and canopy cover. Mortality in these stands would be around 20% or less. Underburning is a preferred method of treatment not only to reduce hazardous fuels but to return fire to the ecosystem. The proposed treatment of Unit 86 is also a natural fuels underburn. Treatment would be done in conjunction with the fuels treatments in the oak units 84 and 85

Roads

For Alternative C, approximately 33.1 miles of existing forest roads would be maintained to allow access to harvest areas for timber haul (See Figure 10) and to reduce adverse impacts to resources, and another 0.6 miles of road used only for rock haul from rock quarries would receive spot rocking and other road maintenance, for a total of 33.7 miles of road maintenance. Road maintenance activities would include felling hazard trees, clearing and grubbing, replacing drainage structures, removing slides, repairing holes in the roadbed, reconstructing ditches, and placement of aggregate surfacing. Forty-five new/replacement culverts would be installed as part of road maintenance activities (see Figure 10). This includes stream crossing replacements listed in Table 6. The stream crossing culvert replacement projects listed in Table 6 would occur on existing roads designated for haul in this project. All stream-crossing improvements would accommodate 100-year flood events.

Table 6. Stream Crossing Culvert Replacement.

Road Number	Existing Condition	Proposed Treatment	Description of Associated Maintenance Activities
2633-720	Closed	Reconstruction	Redesign Mill Creek crossing to pass 100 year peak flows, and allow aquatic wildlife passage.
1900-408	Open	Reconstruction	Redesign unnamed creek crossings to protect water quality.

Existing open roads would be reduced by a total of 0.2 miles with gate or berm closure. Additionally, 0.3 miles of existing closed roads would be decommissioned (see Soils, Watershed, and Fisheries protection Mitigation #16 for description).

Alternative C would also construct about 16,000 feet of new temporary roads and utilize about 9,500 feet of unclassified roads to allow access to harvest. Upon completion of sale activities, the temporary roads would be decommissioned.

Table 7. Roads Decommissioning for Alternative C.

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Treatment Activities	Miles Affected
1500-100	Open	Close	Berm entrance, maintain drainage	0.2
2633-723	Closed	Decommission, end of road only	Remove culvert and fill at MP 0.6, outslope and install waterbars to end of road at MP 0.7	0.1

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Treatment Activities	Miles Affected
2633-761	Closed	Decommission road east of creek	Berm entrance, maintain drainage *	0.1
2633-763	Closed	Decommission road east of creek	Berm entrance, maintain drainage *	0.1
<i>Total</i>				0.5

* Some segments are presently in stable condition and may not require physical treatment to stabilize before re-classifying to “decommissioned.”

Alternatives C as it Responds to the Significant Issues:

Water Quality/Aquatic Resources

Alternative C includes 19 specific Best Management Practices (BMPs) that provide for the protection of soil, water, and fisheries resources, as required project mitigation. The riparian reserve thinning strategy also provides for the retention of effective stream shading vegetation and adequate levels of large wood in riparian reserves that occur in proposed partial cutting units. Silvicultural and fire treatments within riparian reserves are prescribed at distances sufficient to maintain or improve aquatic habitat condition.

Alternative C proposes to thin 137 acres of riparian reserve and prescribed fire treatment in thinned riparian reserve area. These activities are expected to create stand conditions that favor the accelerated development of future large wood and other late successional stand characteristics. This alternative would provide greater immediate diversity of patches and openings compared to the no action alternative, and would create conditions that result in greater plant species richness in thinned portions of riparian reserves.

Alternative C replaces existing drainage features (aged culverts and resized culvert diameters to accommodate 100-year flood flows) and proposes additional drainage structures (ditch relief culverts) that benefit aquatic species habitat downstream of project area roads.

It includes road maintenance on 34 miles of road. This alternative also closes 0.2 miles of currently open roads. Approximately 0.3 miles of currently unneeded roads would also be decommissioned.

Threatened Northern Spotted Owl

All the sites at risk from disturbance are protected through seasonal restrictions which are listed under Wildlife Mitigation Measure #4. No occupied breeding habitat is altered under this alternative. Effects to non-breeding habitat are in compliance with standards and guidelines from the Willamette Forest Plan and U.S. Fish and Wildlife Service guidance. High quality nesting habitat would be protected. Dispersal habitat would be removed within 7 spotted owl home ranges, for a total of 218 acres. These stands are expected to recover to the 40% canopy within 8-10 years. Dispersal habitat would be thinned on approximately 1690 acres, yet would maintain a 40% canopy cover and therefore, will continue to function as dispersal habitat.

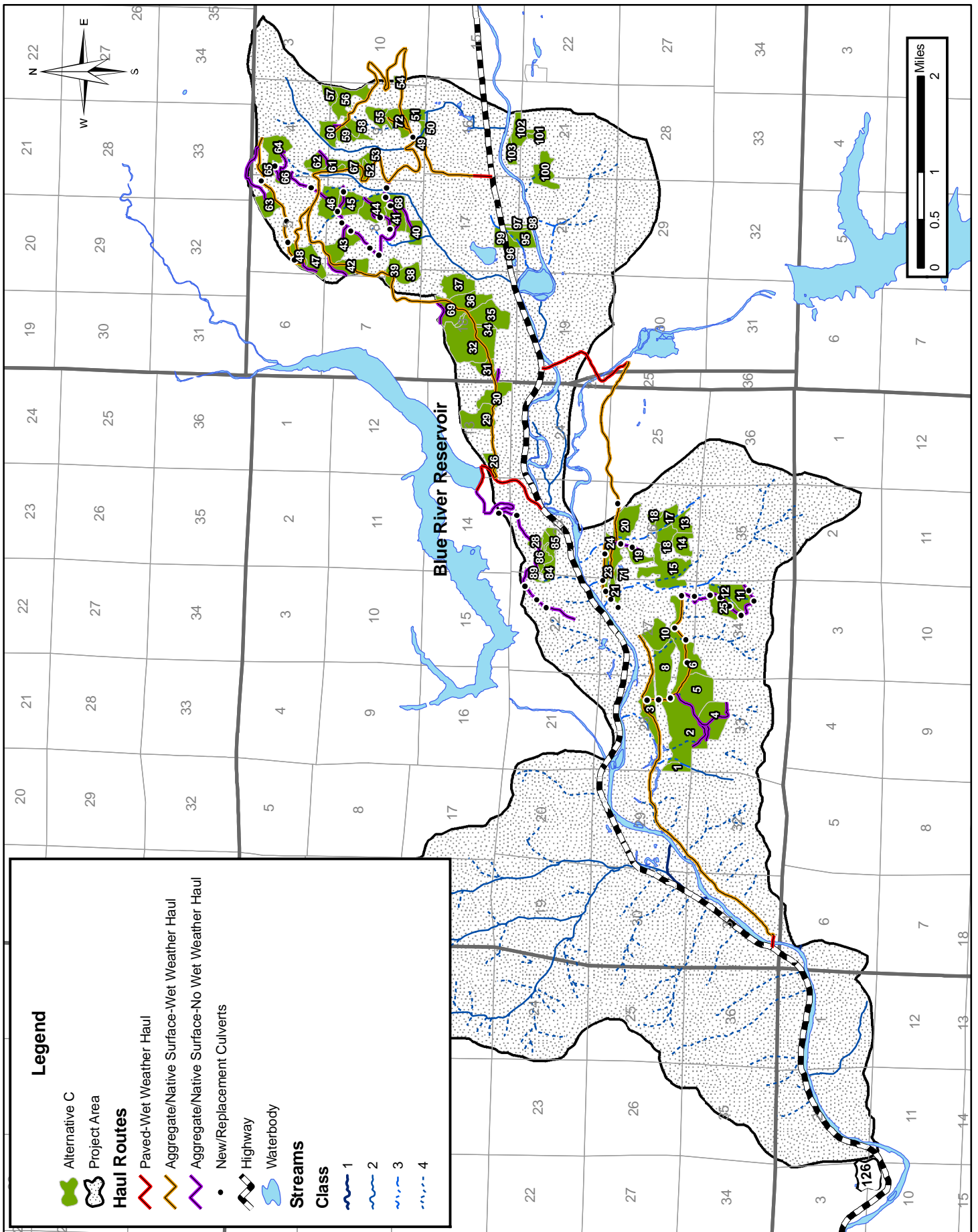


Figure 10. Haul Route and New/Replacement Culvert Locations- Alternative C.

Other Connected Actions and Similar Actions Common to All Action Alternatives

Rock Quarry Development at Mill Creek Rock Quarry

The existing Mill Creek Rock Quarry would be further developed to produce crushed aggregate, pit run aggregate, and riprap for road maintenance needs (see Figure 11). Development at this pit includes removal of soil overburden, drilling and blasting, reducing existing oversize material, and eventual rehabilitation of the site. Currently the Mill Creek Rock Quarry area is 4 acres and 0.5 acre of new development is planned.

Development at this quarry would conform to requirements in the respective pit development plans, which are included in the project analysis file. The anticipated volume of material needed for road maintenance is less than 15,000 cubic yards, and the development plans would specify the location and dimensions of the excavation to produce the estimated volume.

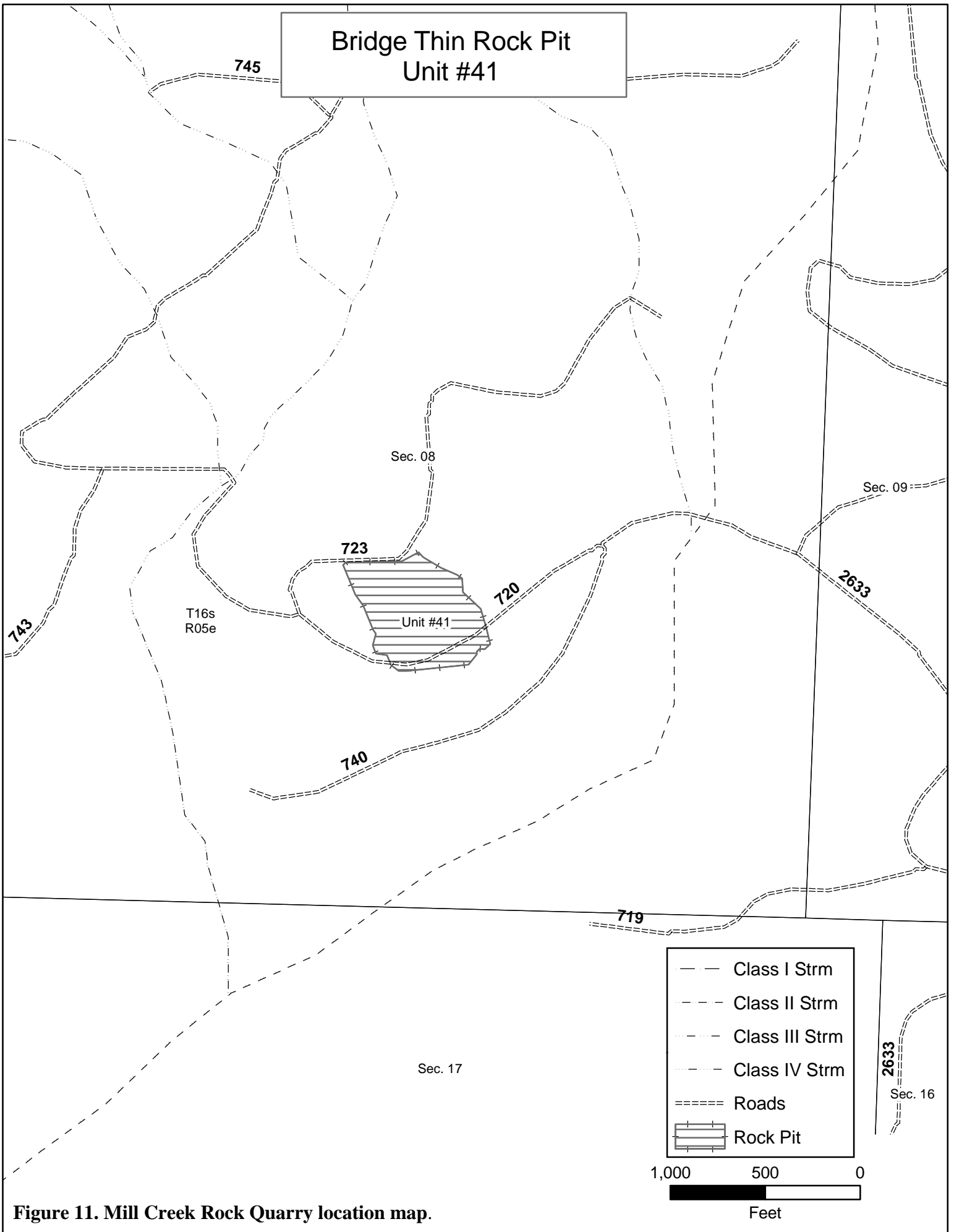
The Rock Quarry is greater than 0.25 miles from any known spotted owl activity center. Seasonal restrictions on blasting would be in place from March 1st to July 15th to avoid potential disturbance to spotted owls.

Temporary Roads

Temporary roads have been identified to facilitate harvest activities. All action alternatives include a total of approximately 25,500 feet of temporary roads as needed to access landings in Units 2, 5, 6, 8, 10, 15, 20, 21, 30, 32, 35, 36, 37, 39, 43, 45, 46, 52, 55, 60, 62, 64, and 70. See Figures 12-25 for segment lengths and logging system related to each unit. These roads would be located on stable, gently rolling terrain, where impacts to soils and streams are unlikely. The location of these temporary roads facilitate the use of yarding systems that can protect resources by minimizing soils displacement and reducing impacts to leave trees within the units. Temporary roads would be decommissioned after completion of logging operations. (See Chapter 2 - Mitigation Measures.).


Mitigation Measures and Design Measures Common to All Action Alternatives

Council of Environment Quality (CEQ) Regulations (§ 1508.20) defines Mitigation as:
• Avoiding the impact altogether by not taking a certain action or certain parts of an action.
• Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
• Rectifying the impacts by repairing, rehabilitating, or restoring the affected environment.
• Reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action.
• Compensating for the impact by replacing or providing substitute resources or environments.



Bridge Thin Rock Pit
Unit #41

723
Unit #41
720

- Class I Strm
- - - Class II Strm
- · - · Class III Strm
- · - · - · Class IV Strm
- ==== Roads
-  Rock Pit

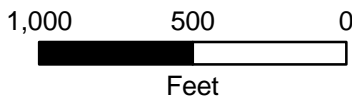


Figure 11. Mill Creek Rock Quarry location map.

Bridge Thin Unit #2 and #5 Temporary Road Location Apx: 4196 feet.

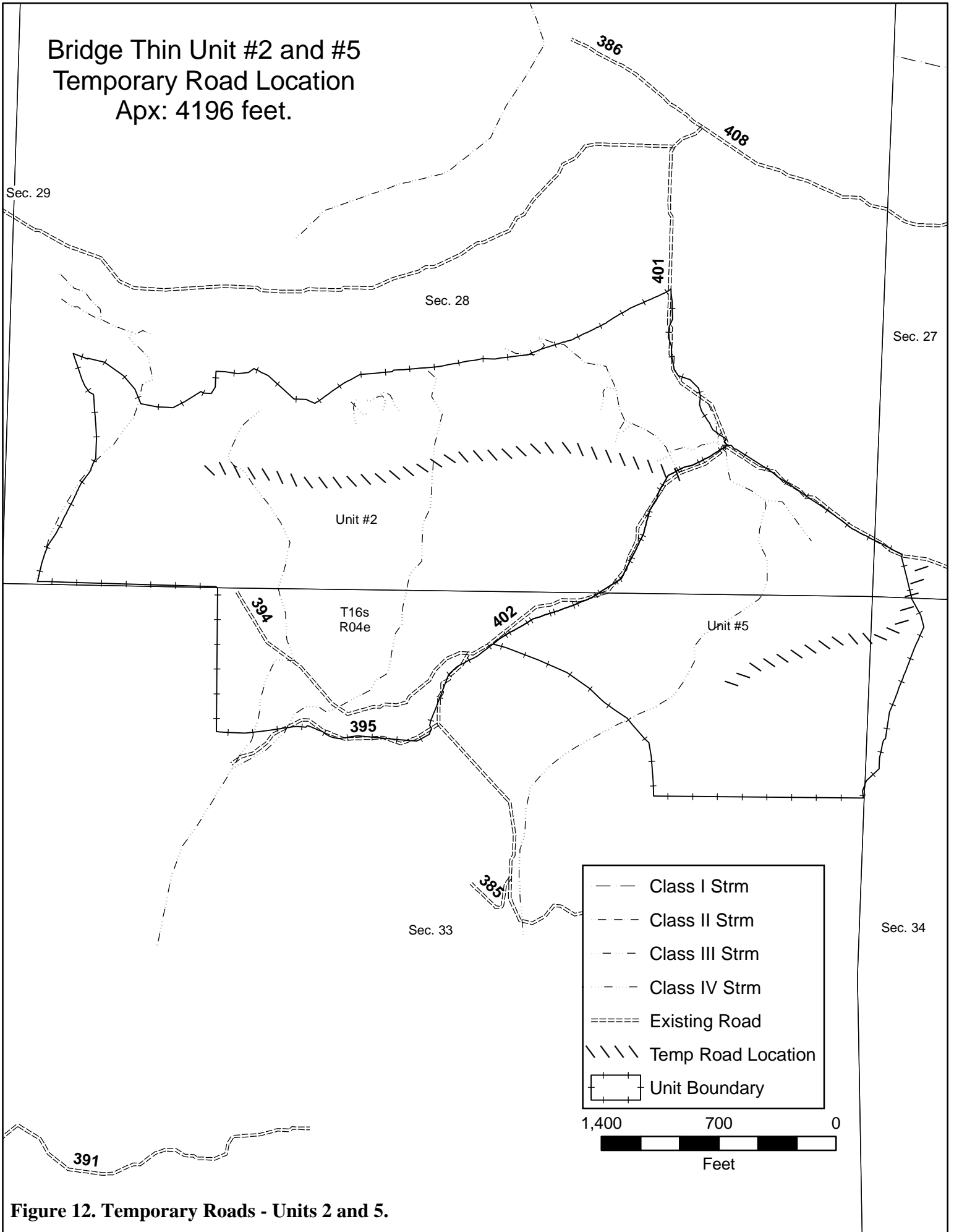


Figure 12. Temporary Roads - Units 2 and 5.

Bridge Thin Unit #6, #8 and #10
Temporary Road Location
Apx: 2819 feet.

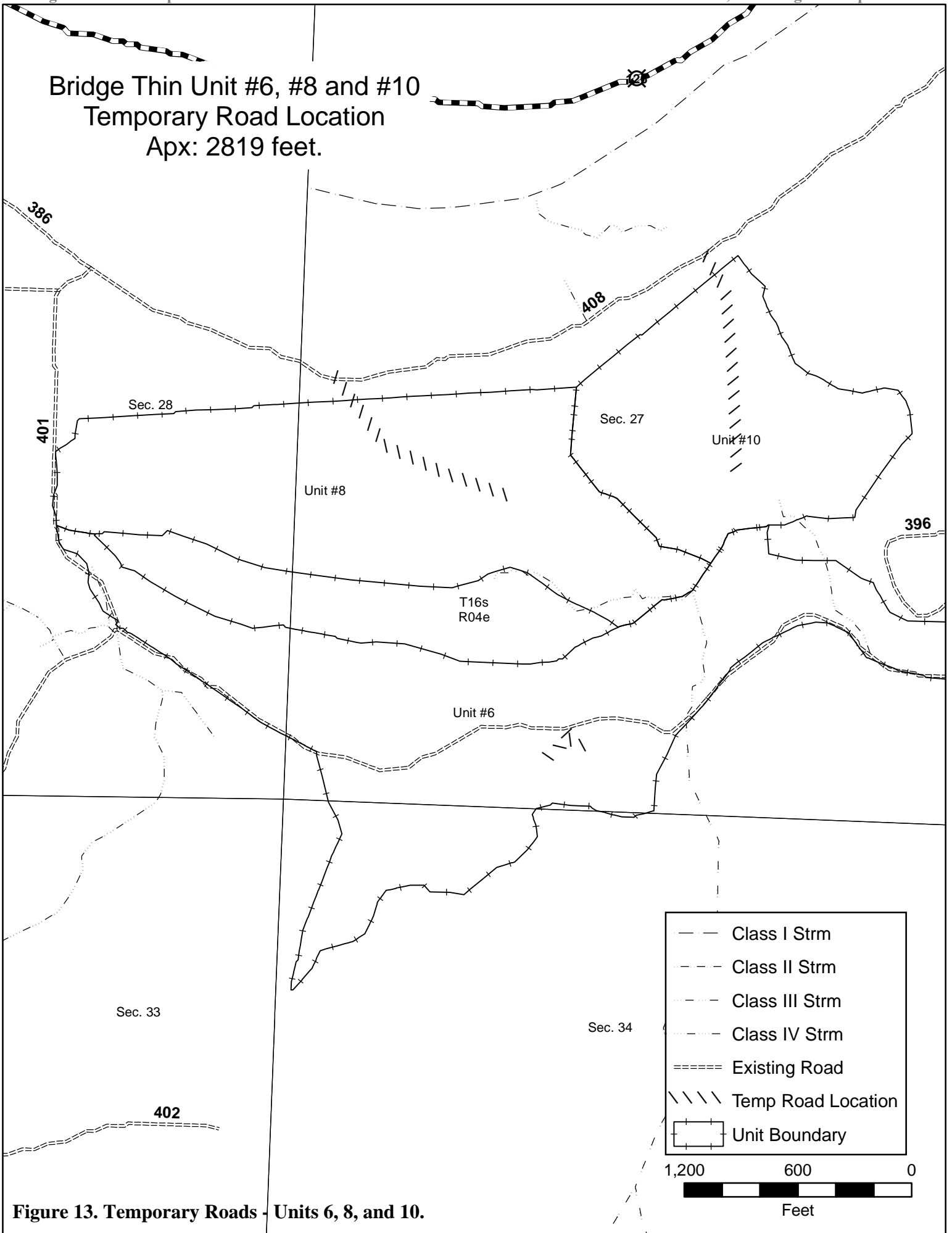


Figure 13. Temporary Roads - Units 6, 8, and 10.

Bridge Thin Unit #15 Temporary Road Location Apx: 1568 feet.

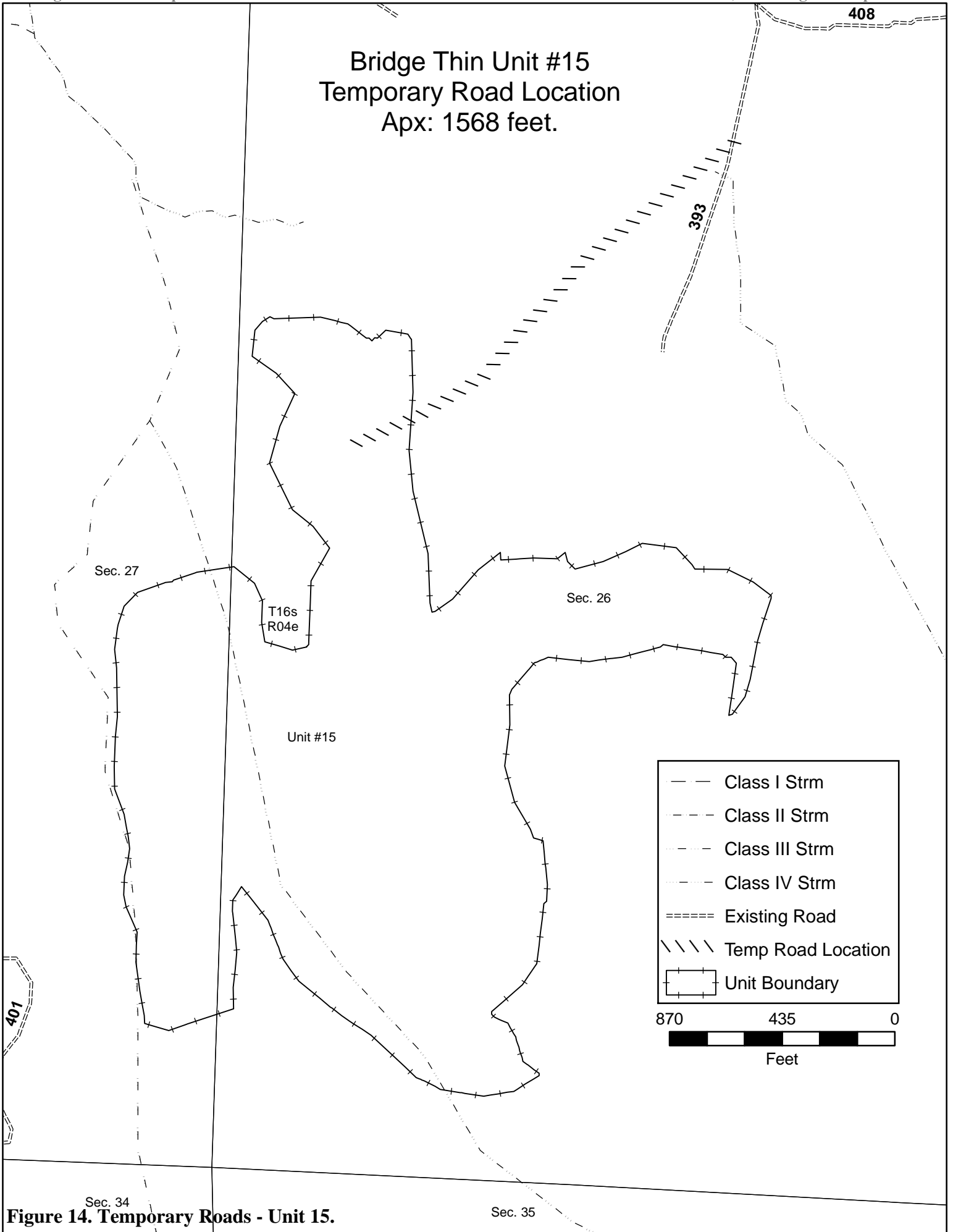


Figure 14. Temporary Roads - Unit 15.

Bridge Thin Unit #20, and #21
 Temporary Road Location
 Apx: 1569 feet.

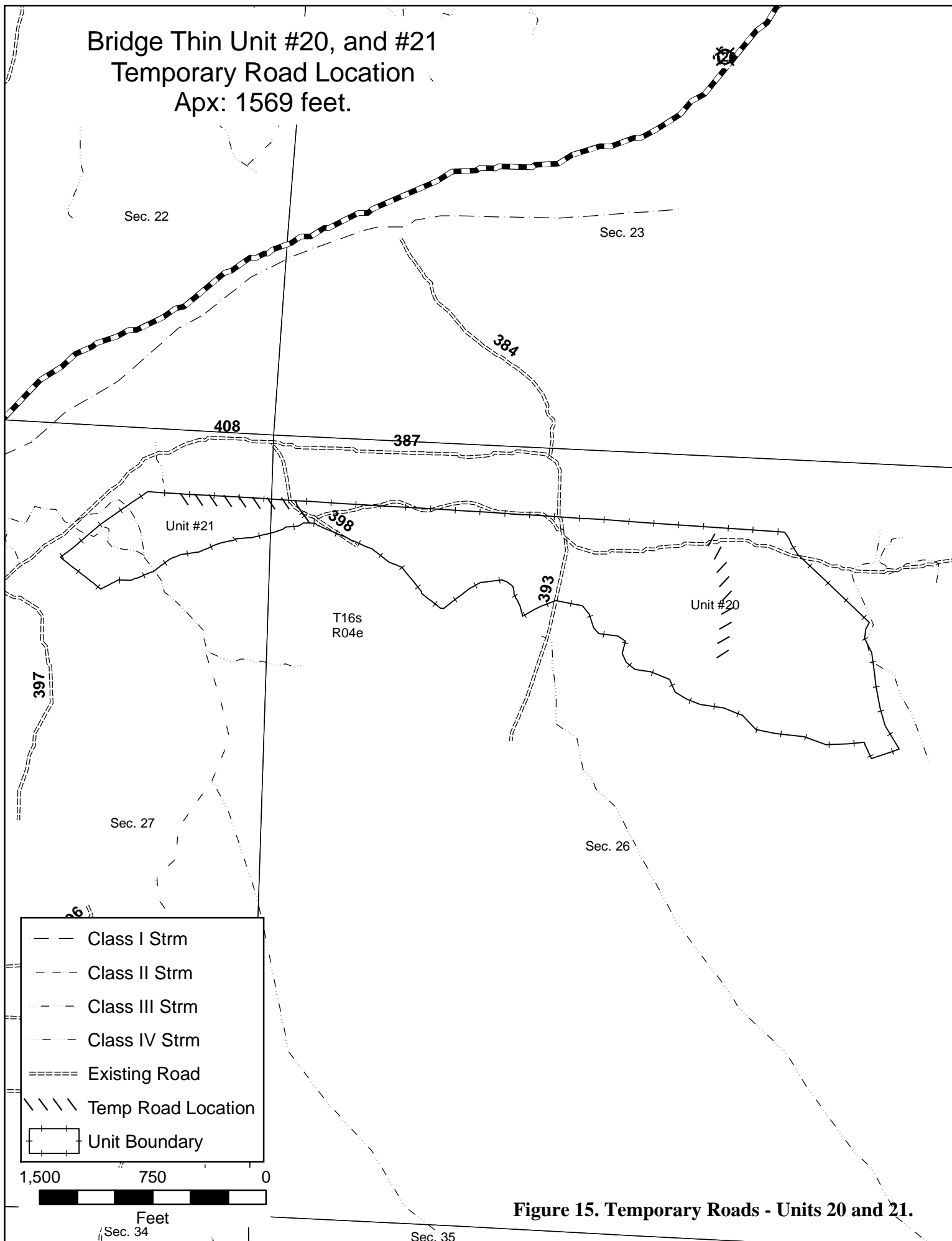


Figure 15. Temporary Roads - Units 20 and 21.

Bridge Thin Unit #30 Temporary Road Location Apx: 829 feet.

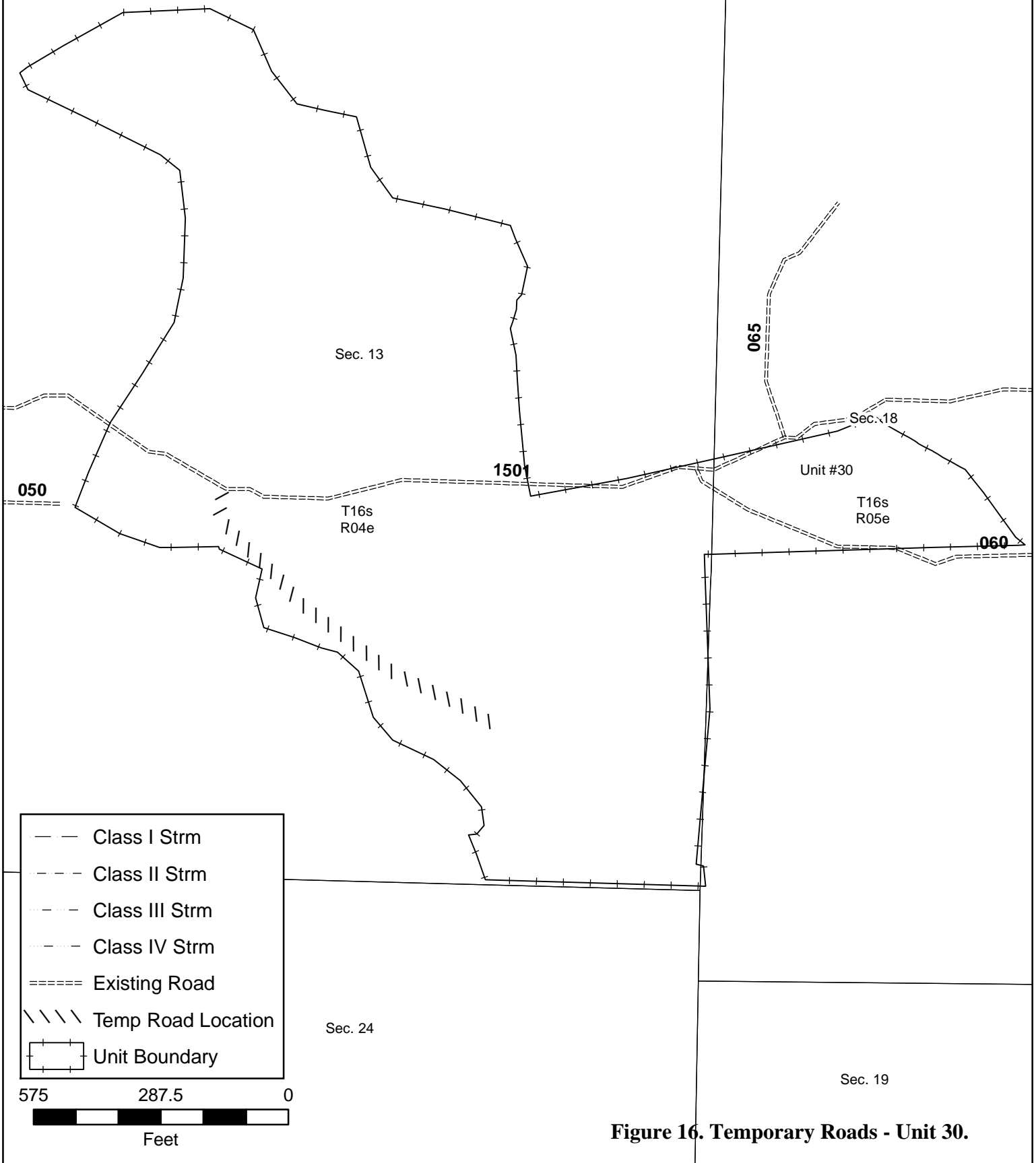


Figure 16. Temporary Roads - Unit 30.

Bridge Thin Unit #32, #35, #36, and #37

Sec. 08

Temporary Road Location
Apx: 8025 feet.

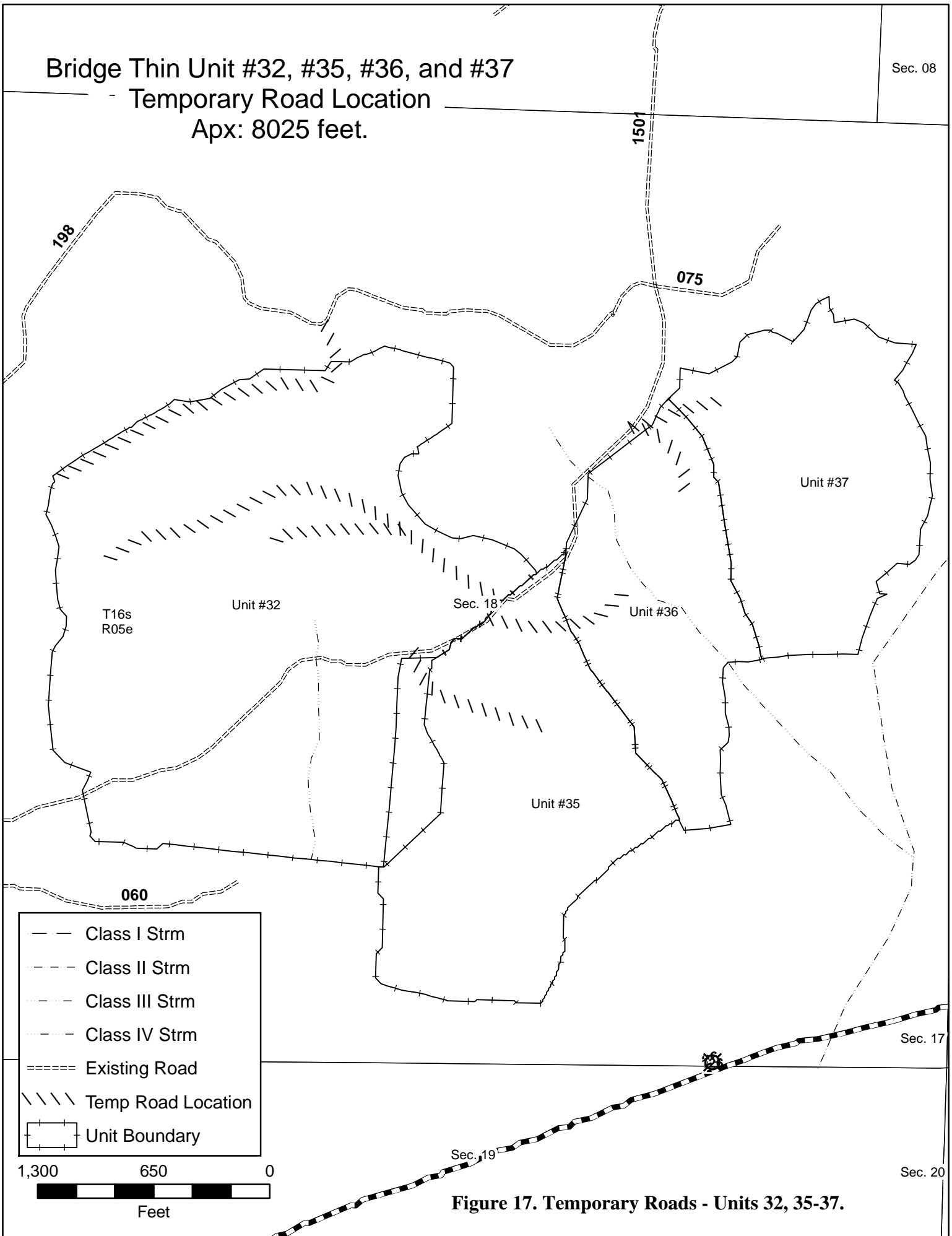


Figure 17. Temporary Roads - Units 32, 35-37.

Bridge Thin Unit #39 and #43
Temporary Road Location
Apx: 966 feet.

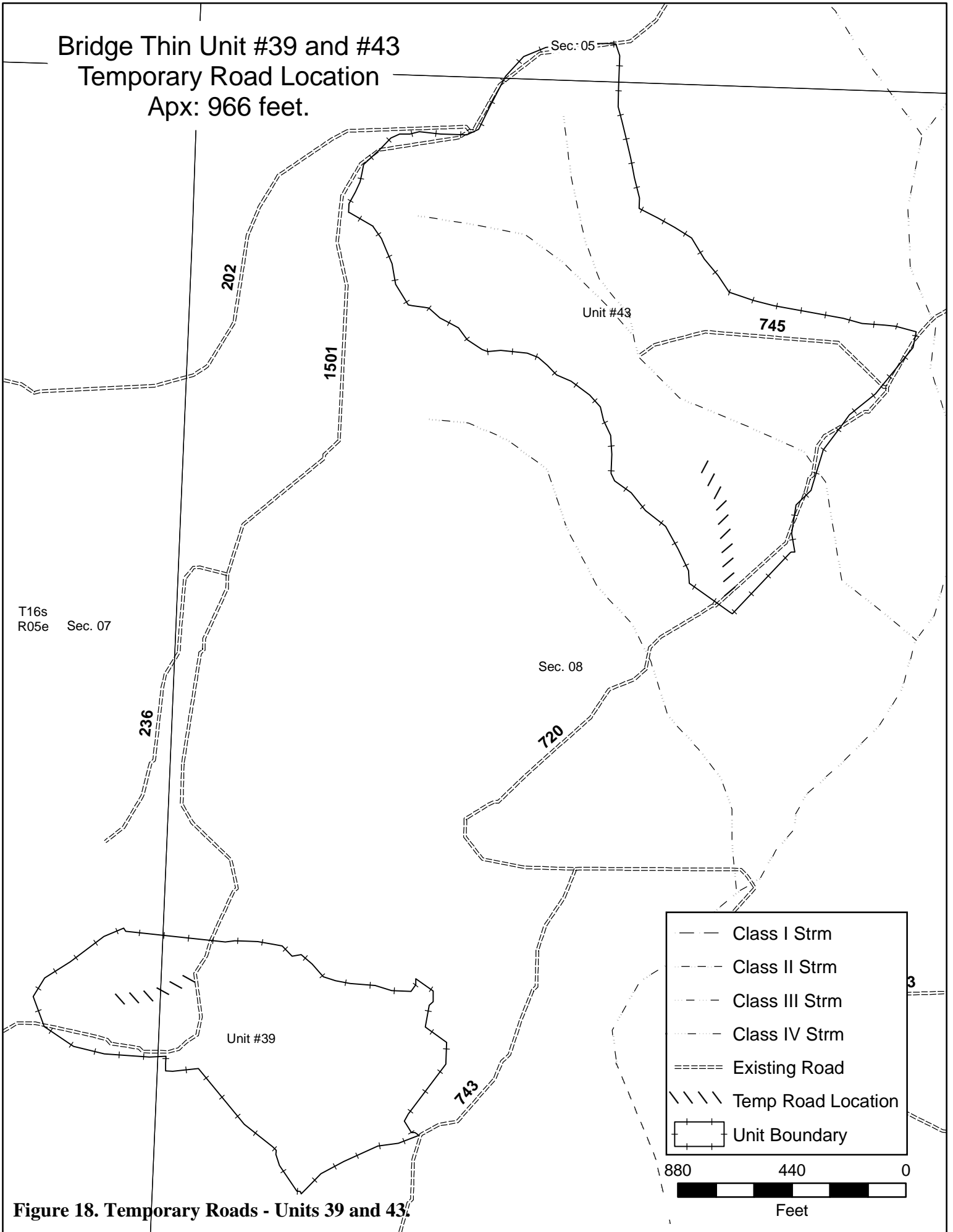


Figure 18. Temporary Roads - Units 39 and 43.

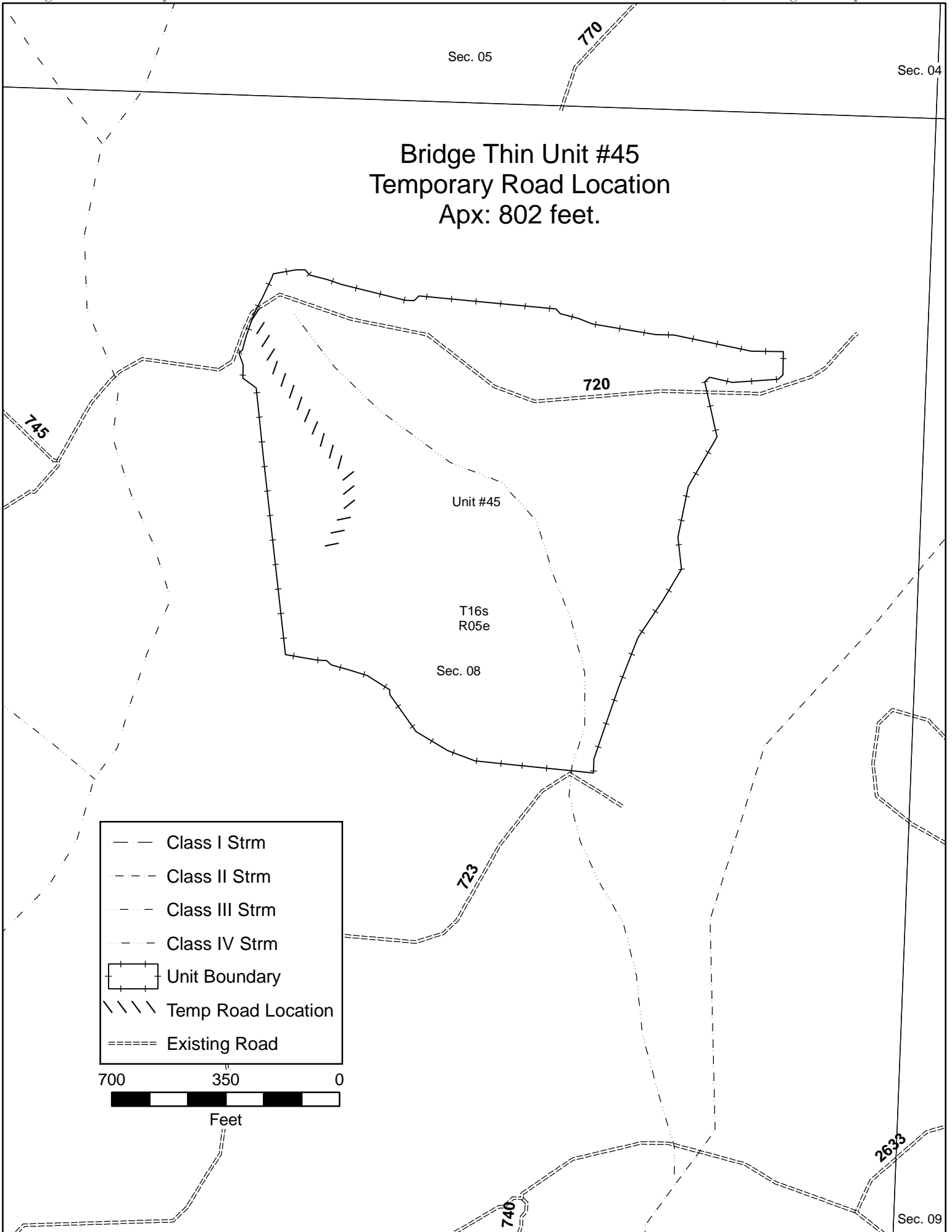


Figure 19. Temporary Roads - Unit 45.

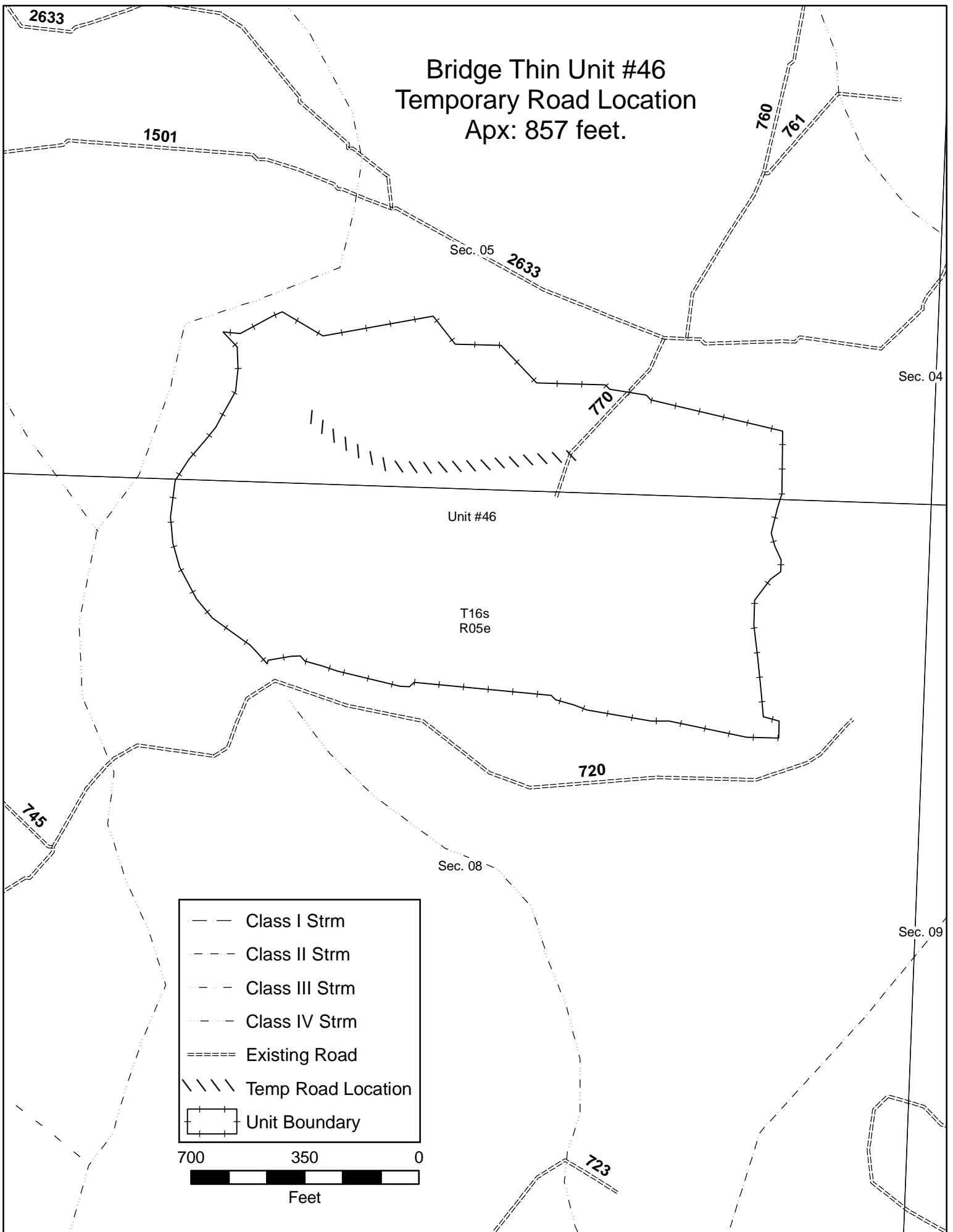


Figure 20. Temporary Roads - Unit 46.

Bridge Thin Unit #52 and #70 Temporary Road Location Apx: 509 feet.

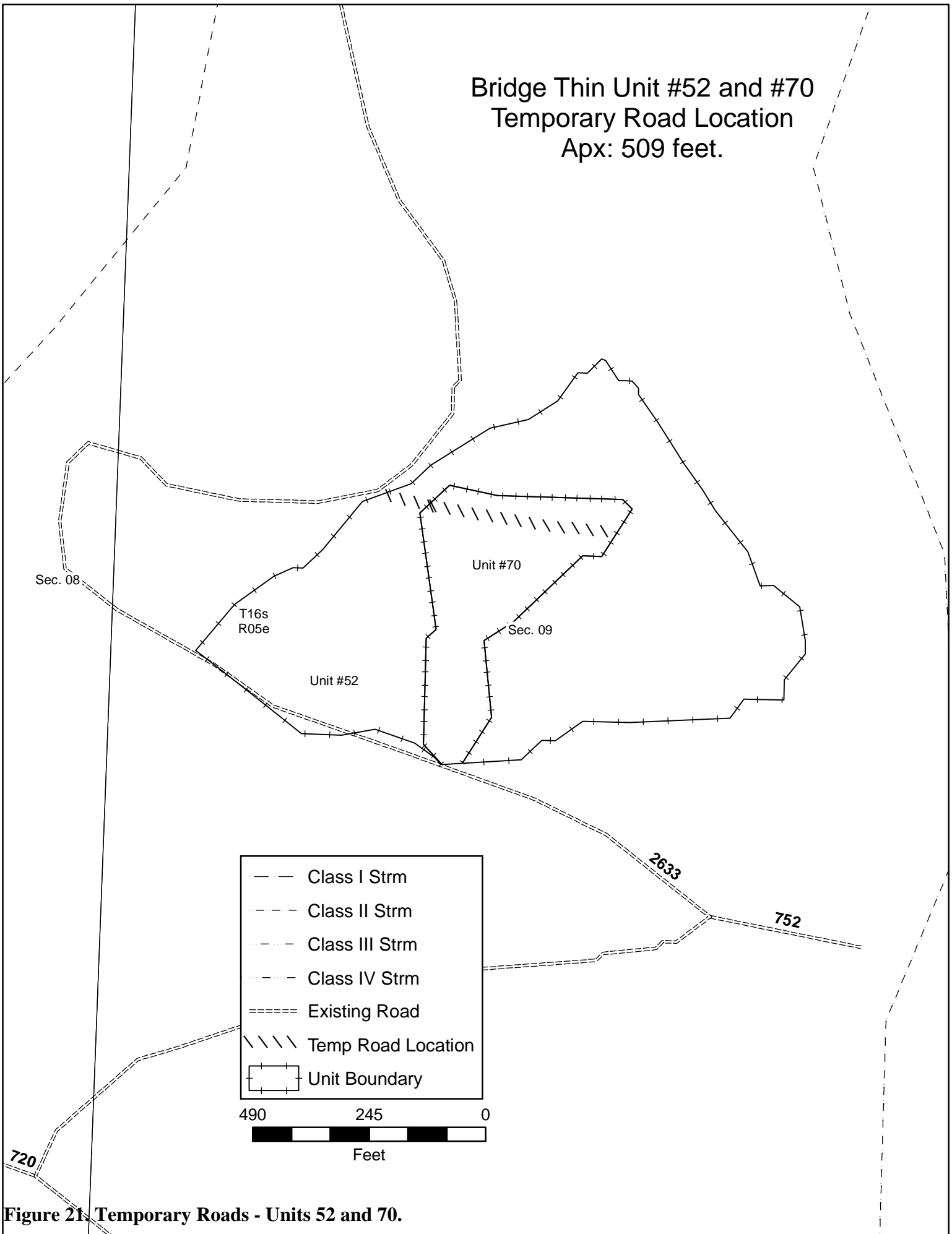


Figure 21. Temporary Roads - Units 52 and 70.

Bridge Thin Unit #55
Temporary Road Location
Apx: 473 feet.

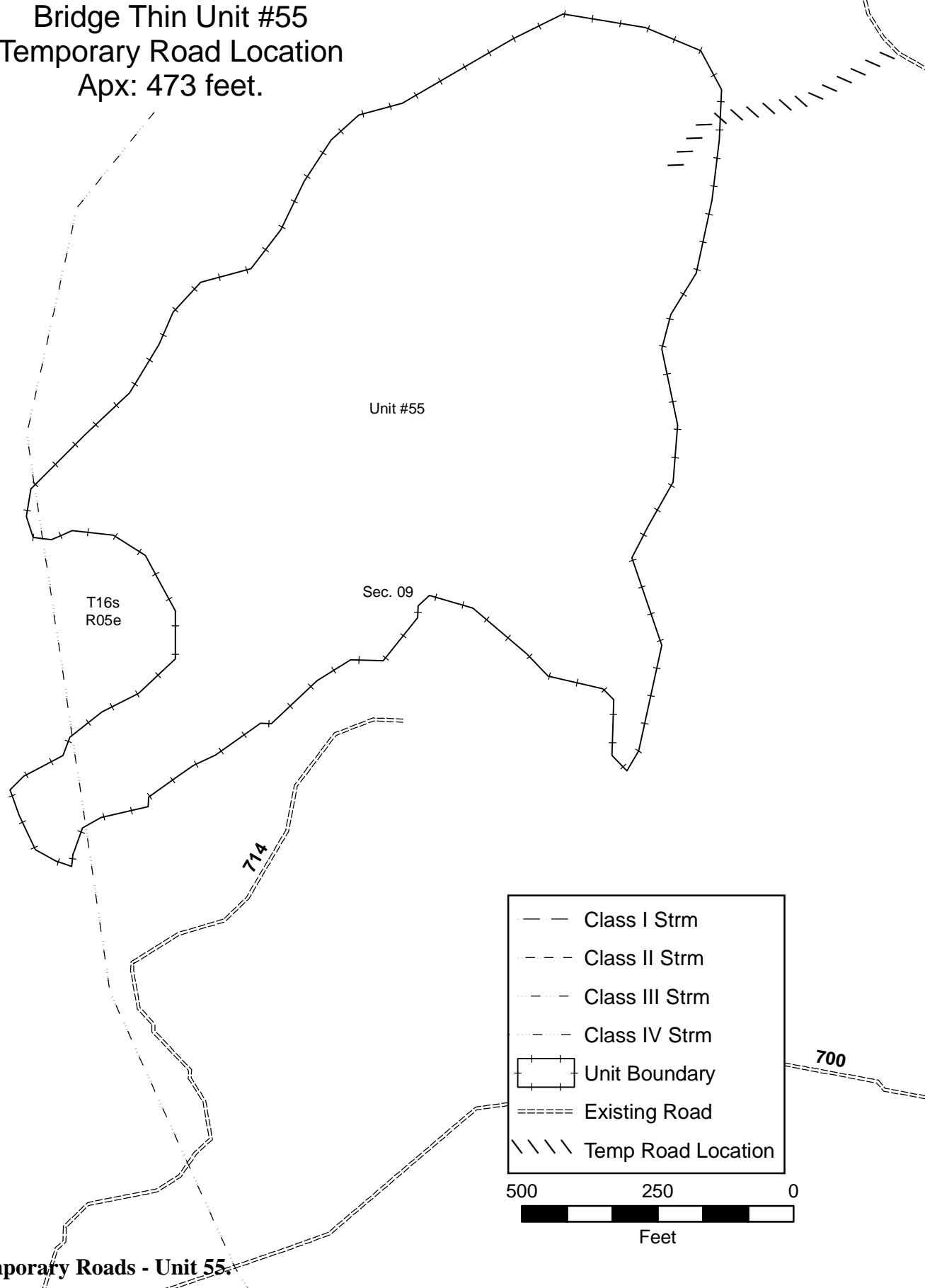


Figure 22. Temporary Roads - Unit 55.

Bridge Thin Unit #60
Temporary Road Location
Apx: 762 feet.

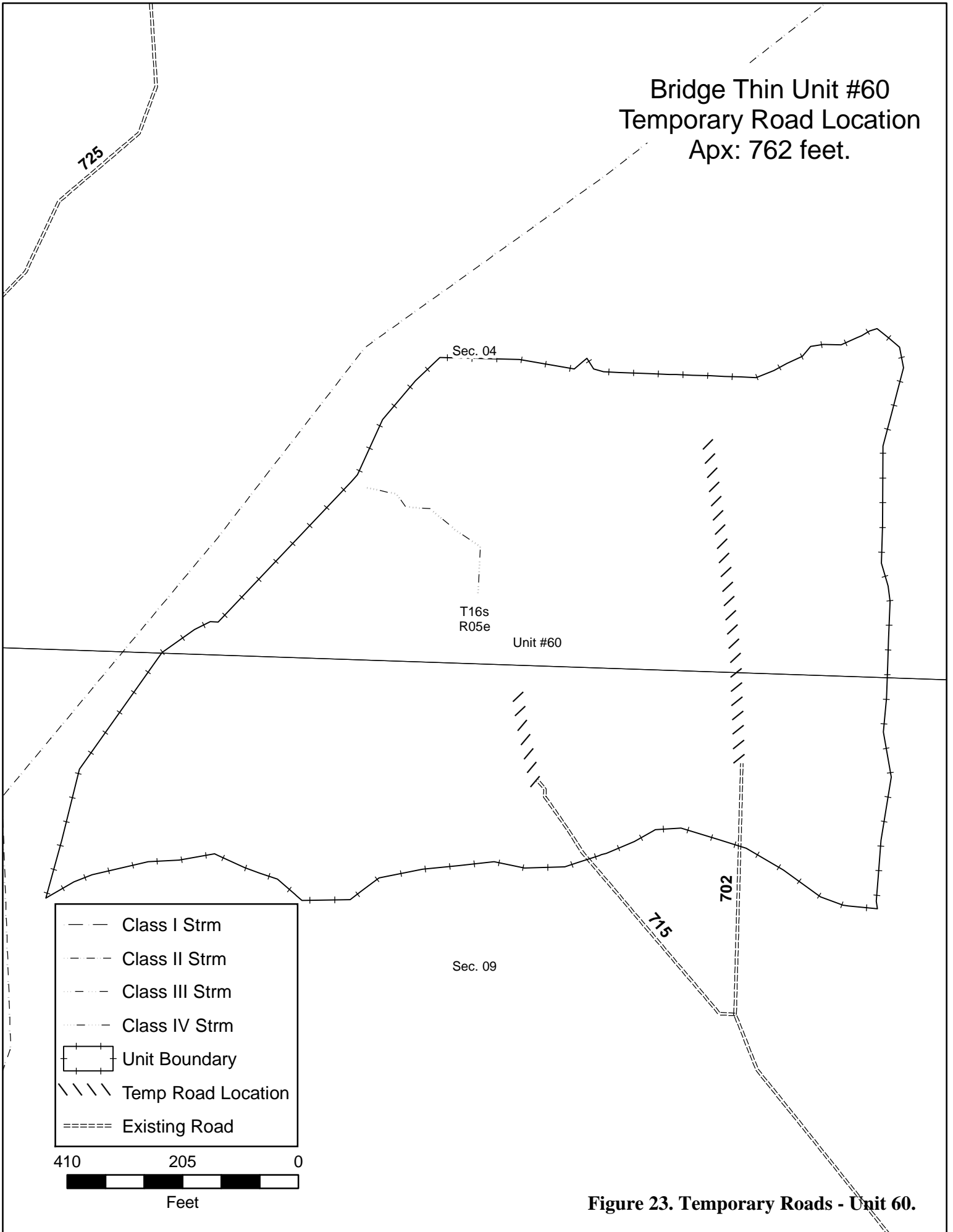


Figure 23. Temporary Roads - Unit 60.

Bridge Thin Unit #62 Temporary Road Location Apx: 801 feet.

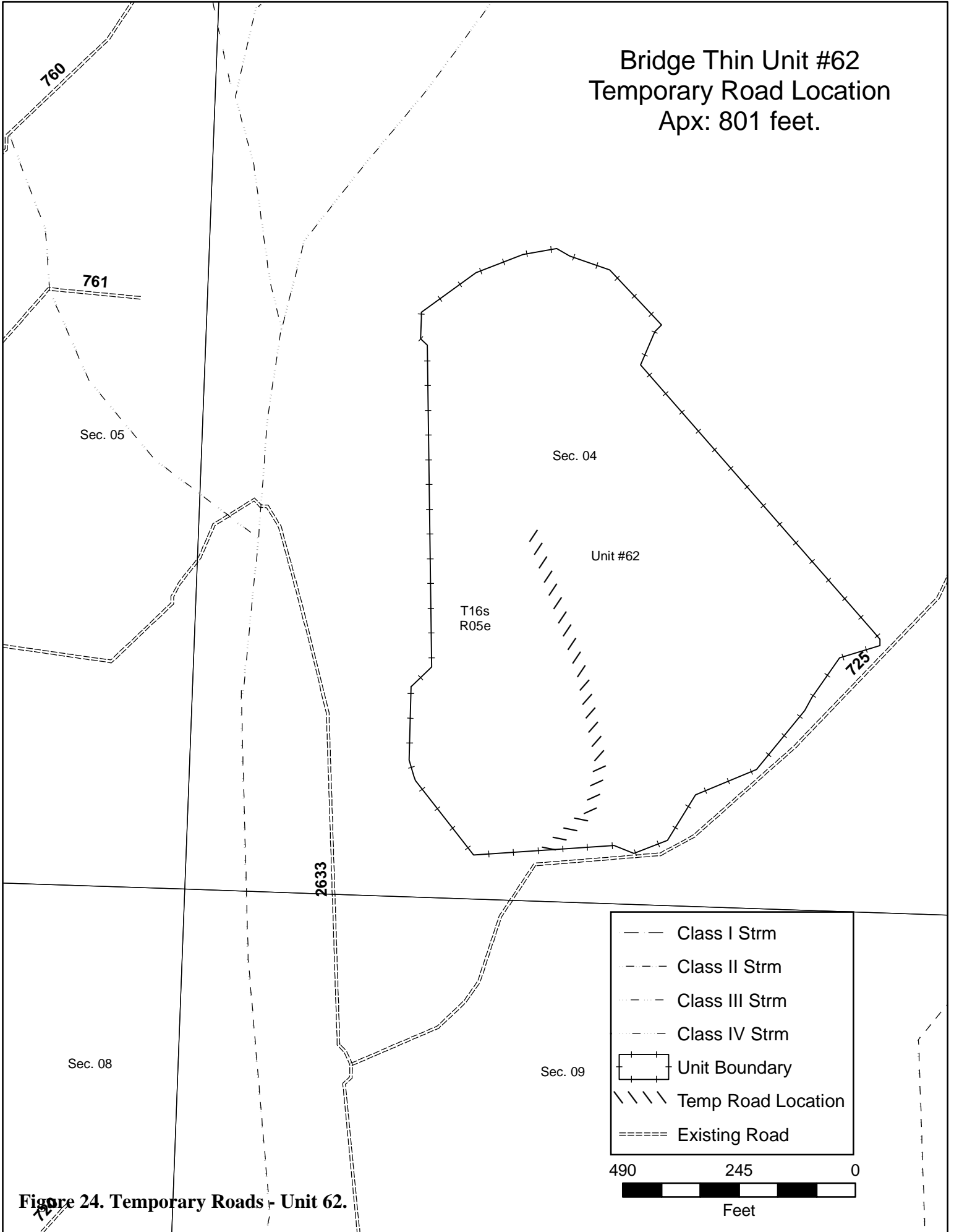


Figure 24. Temporary Roads - Unit 62.

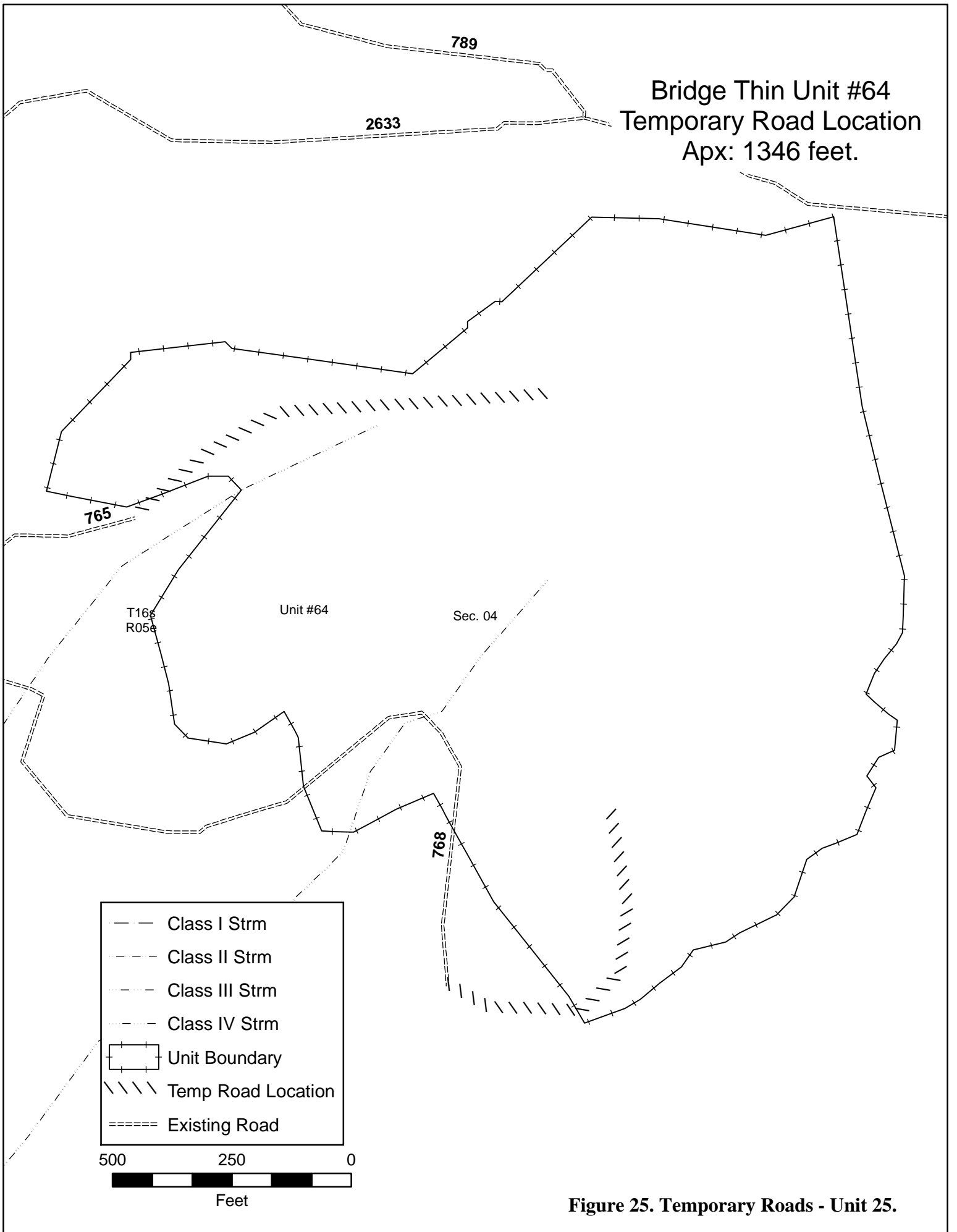


Figure 25. Temporary Roads - Unit 25.

Design measures are also specifically described in this section to provide resource protections that ensure implementation activities remain consistent with Willamette Forest Plan Standards and Guidelines. Mitigation measures and design measures would be implemented through project design and layout, contract specifications, contract administration, and following monitoring activities performed by Forest Service officers.

Silviculture

1. Plant as necessary to augment natural regeneration within gaps to ensure regional stocking levels are met. Plant with species that are not susceptible to the disease, when the gap is the result of root rot. Under-represented species should be planted to help increase diversity.

Soil, Watershed, and Fisheries Protection:

1. Any project activity such as culvert replacement that must occur within fish-bearing and other perennial streams would comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities (July 1st – August 15th). Best Management Practices (BMP's), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included in project design as necessary to control off-site movement of sediment.
2. Native surfaced roads would be restricted for hauling during the winter rainy season between October 15 and May 31. The objectives are to maintain water quality and fish habitat.
3. Construction or maintenance of roads would not be done when soils are saturated or run-off occurs, to minimize erosion and sedimentation. A stable fill would be constructed across all streams when crossed by new temporary roads.
4. All haul roads would be maintained in stable condition. Winter hauling may be allowable when the road surface is either covered with a relatively continuous snow pack or frozen, when run-off from the road is unlikely. Watering the road surface would be used if roads become excessively dusty during the summer.
5. Ground-based equipment used for yarding, processing, fuel treatment, or other project activities would operate only when soils are relatively dry following the rainy season in the spring through the summer, or during the winter months when there is a continuous snow pack of at least eighteen inches deep or when soils are frozen to a depth of six inches or greater. Operations would be suspended before rainfall or precipitation results in off site movement of muddy water into drainage courses.
6. Designated skid trails would be required in all ground-based yarding units. Skid trails would be located outside drainages, seeps, springs and/or concave landforms, which could accumulate and transport overland flow and sediment. Existing skid trails that are outside drainages, seeps and springs that meet the needs of the yarding system should be used wherever possible.
7. Sedimentation and water quality are criteria in determining if ground based equipment can be operated on short slopes >30%. Soil displacement, a key factor in productivity also has an

increased probability on slopes >30% and should be identified as a factor to evaluate if ground-based logging equipment is allowed on steeper slopes. Ground-based equipment would be limited to slopes less than 30 percent for harvester/forwarder and conventional ground skidding operations. Short, isolated pitches up to 40 percent on otherwise suitable slopes may be approved after consultation with soil/watershed specialist determines that sediment transport to streams would not occur as a result. Adverse skidding conditions would be avoided through skid trail layout and use of alternative yarding systems.

8. Ground-based equipment used for yarding, processing, fuel treatment, or other project activities would not be permitted within 120 feet of the stream channel of Class 1, 2, and 3 (fish bearing and perennial non fish bearing streams) streams. Ground-based equipment would not be permitted within 50 feet of the stream channel in Class IV (seasonal, non-fish bearing) streams. In the remainder of the riparian reserve, ground-based equipment is permitted, but would be restricted to existing skid trails from previous entries. Alternative low disturbance ground-based equipment such as shovel yarding is also permitted in the remainder of the riparian reserve.
9. Regardless of unit harvest prescription, portions of harvest units that lie within riparian reserves would be managed to meet riparian objectives. Prescription elements designed to accomplish this are detailed on page 63.
10. Full suspension would be required when yarding over perennial stream channels. Where full suspension is not obtainable over intermittent streams, partial suspension would be required and yarding would be limited to when the stream is dry. Bump logs to protect the stream channel would be utilized as appropriate
11. Where cable yarding requires corridors through a riparian reserve, corridors would be laid out to result in the least number of trees cut. Trees located within no-harvest buffers that must be cut to facilitate yarding corridors would be felled into the channel and left on site.
12. All skid trails and landings would be water-barred to provide adequate drainage. Water bars location should occur where local terrain facilitates effective drainage of the skid trail or landing. In general, water bars should be constructed every 100 feet on slopes less than 15 percent, and every 50 feet on slopes greater than 15 percent. Water bars should be keyed-in to the cut bank and have a clear outlet on the down hill side. Where available, slash should be placed on skid trails and landings.
13. Skid trails in thinning harvest units with ground-based yarding would be scarified to a depth of 3-6 inches.
14. Skid trails in regeneration harvest units and all landings would be sub-soiled to a depth of 18-22 inches.
15. All areas of exposed soil, such as landings, skid trails, decommissioned roads, and cut and fill slopes associated with road construction or maintenance would be seeded with non-invasive cereal grains such as winter wheat, and native perennial species.

16. Temporary roads would be decommissioned after completion of logging operations.
Decommissioning of roads may include: berming the entrance, removal of culverts, out-sloping the road surface, pulling back displaced material onto the road way, installation of water bars, removal of placed rock, and re-vegetation of the road prism.
17. In units containing stream channels, all existing large down wood would be retained within riparian reserves to maintain aquatic objectives.
18. Water sources used by project operations would be reconstructed or maintained as necessary to protect stream bank stability, riparian vegetation, and water quality.
19. Timber harvest and fuels treatments not associated with commercial harvest in riparian reserves would adhere to riparian reserve management measures listed below in Table 8.

Table 8. Riparian Reserve Management*.

	Timber Harvest – Thinning and Group Selection (Includes activity fuel treatment)	Timber harvest - Savanna Restoration and Wildlife Habitat Enhancement (Includes activity fuel treatment)	Fuels Treatments (Not Associated with Commercial Harvest)
<u>Previously Managed Plantation Stands</u> Units 1-7, 8, 10-15, 17-18, 20-21, 23-32, 34-40, 42-70, and 72	Class 1 and 2 - 60' NH, 50% canopy closure from 60'-300' Class 3 - 60' NH, 50% canopy closure from 60'-150' Class 4 - 30' NH Lakes - 300' NH Wetlands - 60' NH	Class 1 and 2 - 60' NH, 50% canopy closure from 60'-300' Class 3 - 60' NH, 50% canopy closure from 60'-150' Class 4 - 30' NH Lakes – 300' NH Wetlands – 60' - NH	Class 1 and 2 – 60' NT Class 3 and Class 4 – 30' NT Lakes - 60' NT Wetlands - 60' NT
<u>Previously Un-managed Stands</u> Units 80-89, 91, 95-103;, and 841	Class 1 and 2 - 300' NH Class 3 - 150' NH Class 4 - 30' NH Lakes - 300' NH Wetlands - 150' NH	Class 1 and 2 – 300' NH Class 3 – 60' NH, 50% canopy closure from 60'-150' Class 4 – 30' NH Lakes – 300' NH Wetlands – 150' NH	Class 1 and 2 – 60' NT Class 3 and Class 4 – 30' NT Lakes - 60' NT Wetlands - 60' NT

*: NH = No Harvest

The preceding list describes the Soil, water, and Fisheries mitigation measures that would be applied in the implementation of the proposed action Alternative B, or with the selection of Alternative C. These measures, or equivalent effective measures, would be incorporated into individual unit prescriptions by resource specialists as needed to mitigate potential undesirable effects.

Recreation:

1. Post an advance notice of operations at Blue River Reservoir boat ramp and King Castle Trailhead.

Wildlife:

1. A minimum post treatment canopy closure of 40 percent will be maintained in treatment units within the Critical Habitat Unit (units 46-48,57, and 60-66).
2. Snags would be retained when not a safety concern to support northern spotted owl and other primary cavity excavators.
3. To secure a visual screen for big game, 50-foot no-harvest buffers would be left within harvest units along forest service roads 1501 and 2633.
4. To reduce potential disturbance to any nesting spotted owls in the area, seasonal restrictions for burning and blasting would be imposed on disturbance activities in Table 9. These restrictions may be lifted if surveys are conducted and non-nesting is verified for the year of operation.
5. Large woody material: At least 240 lineal feet per acre of decay class I and II material greater than 18” diameter and 20 feet in length would be retained within all harvest units. Where the preferred size of material is not available, 240 lineal feet per acre of the largest diameter leave trees would be retained.
6. Hazard trees that are felled within units would be left on site for coarse woody debris.
7. A seasonal operating restriction is required for the Cascade Elk Rifle season, which is typically the third week of October. All public vehicle traffic would be restricted on closed roads beginning the Friday before this week through the end of the following Friday.

Table 9. Seasonal Restrictions Design Measures to Protect Northern Spotted Owl.

Unit	Seasonal restriction for burning	Seasonal restriction blasting at Rock Quarry development
41	No	Yes, March 1 – July 15
60	Yes, March 1 – July 15	No

Sensitive Botanical Species:

1. A no-disturbance buffer would be placed around known occurrences of sensitive plant species. Sizes of buffers are listed in the Botanical BE in Appendix C. Broadcast burning would not be implemented within the no-disturbance buffer. Trees would be felled away from the no-disturbance buffer.

Special Habitat Areas:

1. A no-harvest buffer would be placed around special habitats listed in Table 23. Sizes of buffers are listed Appendix C. Trees would be felled away from the no-disturbance buffer.

Heritage Resources:

1. Heritage resources identified during project development were avoided through project design; however there remains the possibility that buried prehistoric or historic cultural resources are present in the activity units and could be uncovered during project activities. If cultural resources are encountered during the course of this project, earth-disturbing activities in the vicinity of the find should be suspended, in accordance with federal regulations, and the zone archaeologist notified to evaluate the discovery and recommend subsequent courses of action. The appropriate timber sale contract provision would be included to provide for notification of the FS and protection of heritage resources.

Other Design Measures**Wildlife:**

1. Minimize damage to existing adjacent trees and vegetation when falling and yarding hazard trees along the haul-route, especially the large diameter trees and snags retained.
2. If Threatened, Endangered, or Sensitive (TES) wildlife species are found in future field work or during activities associated with this project, and potential for adverse effects exists, project modifications would be pursued and would be implemented. All contracts will include provisions to provide required protection measures in the event of TES species discovery.
3. The wildlife biologist shall be notified of any changes made to this project that would alter the need for seasonal restrictions, resulting in either waiving or applying additional restrictions. Examples include changes in locations of helicopter landings, additional helicopter use, or blasting.
4. Implement planned road closures as soon as possible after forest products removal operations are completed to benefit wildlife species needing seclusion.

Invasive Plants Control:

1. All off-road equipment would be cleaned to remove all dirt and debris prior to entering National Forest System lands and when moving from infested to non-infested areas within the project area. Cleaning methods can utilize compressed, high pressure water, or other specified methods.
2. Equipment should work in non-infested areas and then move to infested areas (USFS would provide map).
3. Pre and post harvest survey and control of Invasive Plants would be applied to all harvest units and associated roads in the planning area.
4. Clean fill (soil or rock free of slash and debris) should be used for construction of temporary roads. Sources of rock and fill material needs to be free of Invasive Plants. Rock quarries that may be used would be surveyed for Invasive Plants prior to use. If Invasive Plants are found, they would be treated as necessary prior to use.

5. Disturbed areas (culverts, road shoulders, closed/obliterated roads, landings, skid trails) would be re-vegetated with weed-free native seed to compete with noxious weed seed. Weed-free mulch would be used if necessary.
6. Roads to be bermed or decommissioned would be treated for noxious and non-native weeds prior to blocking to harvest activities. All roads with disturbed soil would be planted with native plant material to prevent invasion by non-native species.
7. Bermed and decommissioned roads would be monitored for Invasive Plants for three years after the road treatment is completed. Identified weed populations would be treated.

Fuels Treatment:

1. In riparian reserves prescribed fire may be allowed to back through the buffer in order to reduce the amount of fireline constructed along the unit and riparian reserve boundaries.

Hydropower:

1. Prior to implementation, Eugene Water & Electric Board and Bonneville Power Administration would be notified of project activities in treatment areas adjacent to transmission lines.

Silviculture Prescriptions _____

Table 10. Stand Treatment Prescriptions.

Stand Treatment (Salvage not included)	% Maximum SDI* ⁺	Post-Harvest % Canopy Closure** ⁺	Alt. A Acres	Alt. B Acres	Alt. C Acres
Moderate Thinning	35-45%	50-65%	----	391	377
Heavy Thinning	17-34%	40-55%	----	1,368	1,260
Wildlife Thinning	13-17%	30-50%	----	190	180
Oak Thinning	17-24%	20-45%	----	33	33
Riparian Thinning	31-52%	50-55%	----	145	137
Group Select	----	----	----	29 ^{***}	29 ^{***}
Fuels Thinning ⁺⁺	----	----	----	142	142
Natural Fuels Underburning ⁺⁺				51	49
Total Acreage	----	----	----	2,449	2,271

*SDI: Stand Density Index

**Riparian Reserves within all prescriptions maintain 50% minimum canopy closure.

***Not included in total acres because these acres are counted in the overall unit acres.

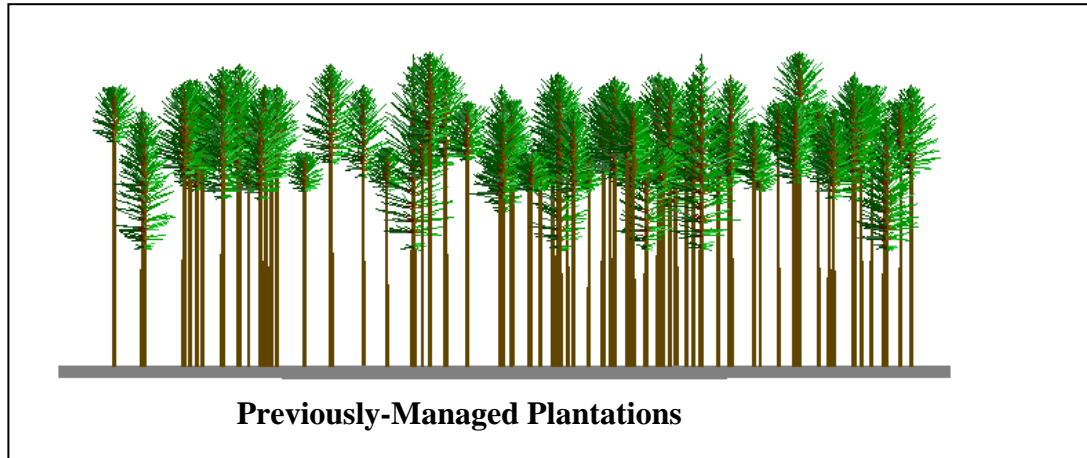
⁺Calculated on trees >= 7” dbh

⁺⁺ No significant change in SDI or canopy closure due to removal of ladder fuels and brush <7” dbh

Current Stand Conditions

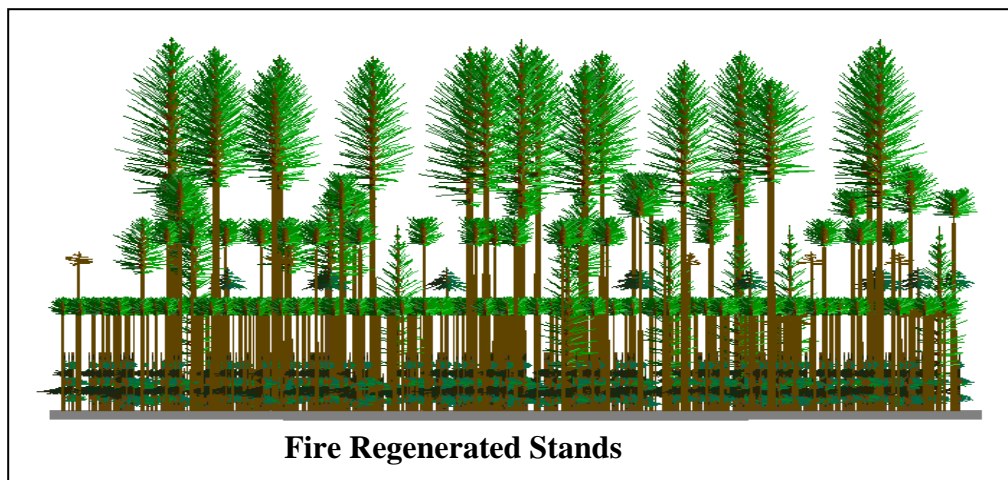
Previously-managed Plantations

These stands range between 40-80 years old, and are the result of previous clear-cut harvesting. Stands in the 35-45 year age class are the most common age class in the project area. They are predominantly comprised of Douglas fir trees at moderate to high density stocking levels. Root rot exists in scattered areas and at low intensities. Units with a unit number less than 80 are previously managed plantations.



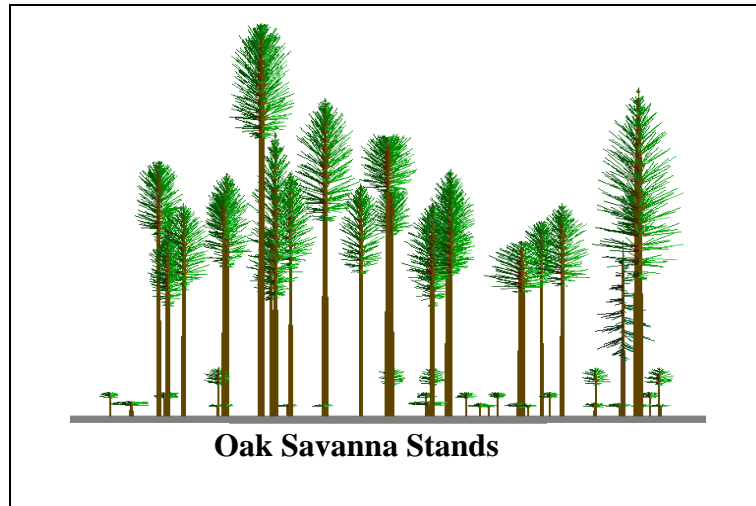
Fire Regenerated stands (estimated 80-120 years old)

Some fire originated stands that are approximately 80-120 years old, have been identified for thinning. Thinning is proposed because current stocking levels are high. These stands were established after stand-replacing fires occurred in the late 1800's or early 1900's. The over-story is primarily Douglas fir with some western hemlock, and other various species. Scattered remnant old growth trees can also be found in most of the units. Selective harvest is evident in the stands with remnant stumps. Root rot pockets and signs of Douglas fir beetle have been known to exist in some of the stands contributing to the low and moderate levels of downed wood. Understory regeneration of shade tolerant species is starting to occur.



Oak Savanna Stands (estimated 80-120 years old)

The stands are remnant pockets of Oak Savanna that are being encroached upon by conifers. Shade resulting from the encroaching conifer species is hampering the regeneration of the Oregon White Oak (*Quercus garryana*). The Oak Savanna habitat relies on fire to reduce competition from conifers, which provides the slower growing, more shade intolerant oak better opportunities to propagate.



Silviculture Descriptions

Thinning

Intermediate cuttings of stands used for the reduction of stand density or management of species composition are called thinning. The main objective is increasing the overall growth potential of the residual trees while removing trees that would ultimately die from suppression. The thinning can be applied throughout a range of densities. A very light or salvage thinning confines removals to overtopped or suppressed trees where the canopy remains unbroken or only slightly broken. In contrast, a heavier thinning removes additional and higher crown classes opening the canopy to accelerate growth and crown expansion of the remaining trees. The remaining trees also develop into a healthier and more stable stand over time.

Group Select

This prescription would provide for gaps in the stands to increase diversity and forage. Group selects would be randomly placed unless a root rot pocket is identified. If a root rot pocket is identified, a 50' area surrounding root rot pockets would be cleared, resulting in the group select. Group selects would be small holes approximately an acre in size, except in riparian areas, where they would not exceed 0.5 acres. In the case of a root rot pocket, gaps created by the removal of root rot pockets would not exceed 5 acres in size, and this is expected to be infrequent. All but the largest trees (4 per acre of the largest size class for the pocket) are to be removed. Follow-up planting with species that are non-susceptible to the species of root disease may occur in root rot pockets. Large downed wood on the

forest floor would be maintained or increased. Snags would be maintained on site if not a hazard to logging operations. Burning and site preparation for planting may occur if necessary, depending on post logging slash load and needed slash components of early seral habitat.

Silviculture Prescriptions

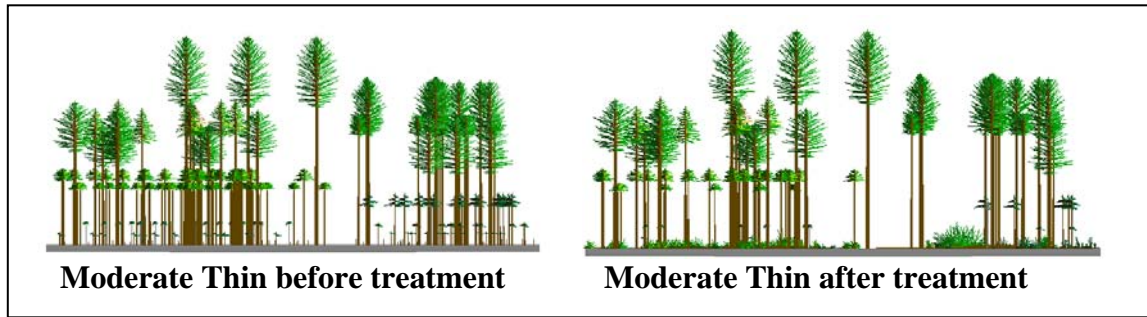
Silvicultural treatments prescribed for the selected units include moderate thinning, heavy thinning, wildlife thinning, oak thinning, riparian thinning, and fuels thinning. This combination of treatments are prescribed by the IDT team in order to meet the various resources objectives derived from Forest Plan and project-level management direction, as well as the site specific conditions of the project area.

Stand Density Index. The stand treatments developed for the Bridge Thin project units are based on the Stand Density Index (SDI), which is a relative measure of the stand's density with a maximum SDI that varies for each tree species. SDI is based on a percentage of SDI^{max} , which is the maximum stem density a stand can support. At approximately 50% maximum SDI, maximum stand production occurs and individual tree vigor would begin to decline (Long, 1985). Thus, lower levels of SDI should be maintained in order to meet stand objectives, like growth for sustainable timber and mean tree growth for various wildlife habitat objectives.

Treatments would maintain or improve overall stand growth and vigor by reducing competition for limiting resources, like light, water, and soil nutrients. Thinning would also increase individual tree stability making them more resistant to wind-throw as they mature. Trees would also be more resistant to insect infestations and disease. Understory shrubs and other vegetation would become established, or expand beyond areas where they currently exist into the openings created. Some natural regeneration of trees would also occur. Residual trees would respond over time with increased diameter growth and crown expansion. Consequently, another commercial thinning would likely be necessary in approximately 15 to 20 years when the maximum SDI levels again exceed 50%.

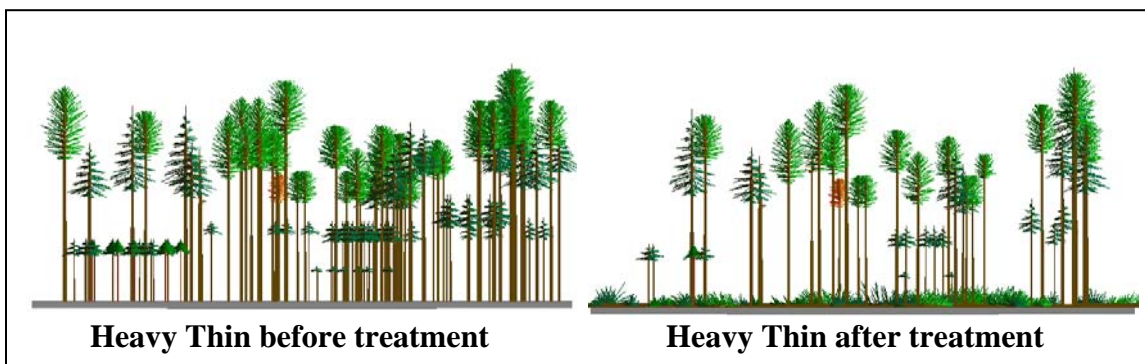
Moderate Thinning

The moderate thinning prescription (Rx) is proposed for the stands where exams have shown less than 200 trees per acre that are seven inches and greater in diameter at breast height (dbh). Units that would not be economically viable or could pose a safety concern were assigned Heavy Thinning prescriptions. Alternative B has 391 acres of Moderate Thin identified in Table 2. Alternative C has 377 acres of Moderate Thin identified in Table 5. The stands would be thinned to maintain 50-65% canopy closure and a post-treatment SDI of 35-45% the SDI^{max} . Trees removed would primarily be the smaller diameter Douglas fir trees in the stands. The goal is to increase growth and vigor of remaining trees, with emphasis placed on maintaining non-Douglas fir species. This prescription would maintain or increase vegetative diversity and resistance to future insect infestations and disease. Thinning the younger stands would also increase individual tree stability making them more resistant to wind-throw as they mature. Decreasing the tree density would also reduce fire susceptibility.



Heavy Thinning

The heavy thinning prescription is proposed for the stands where exams have shown more than 200 trees per acre that are seven inches and greater in diameter at breast height. Alternative B has 1,368 acres of Heavy Thinning identified in Table 2. Alternative C has 1,260 acres of Heavy Thinning identified in Table 5. The stands would be thinned to maintain 40-55% canopy closure and a post-treatment SDI of 17-34% of SDI^{max}. Trees removed would primarily be the smaller diameter Douglas fir trees in the stands. The goal is to increase overall growth and vigor of the remaining trees and reduce the future mortality and susceptibility to insects, disease, fire, and wind. Emphasis would be on maintaining non-Douglas fir species. This prescription would maintain or increase vegetative diversity by opening the canopy to allow for in-growth of seedlings and development of some understory shrubs. Large wood on the forest floor would be maintained or increased. Snags would be maintained on site if not a hazard to logging operations. Thinning the younger stands would also increase individual tree stability making them more resistant to wind-throw as they mature.



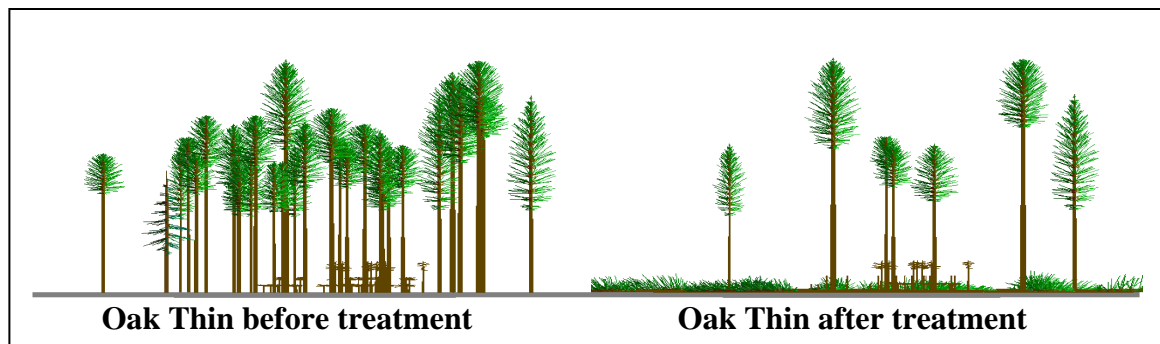
Wildlife Thinning

The wildlife thinning prescription is proposed for the stands where the emphasis is to create forage habitat for big game species. Alternative B has 190 acres of Wildlife Thinning identified in Table 2. Alternative C has 180 acres of Wildlife Thinning identified in Table 5. The stands would be thinned to maintain 30-50% canopy closure and a post-treatment SDI of 13-17% of SDI^{max}. Trees removed would primarily be the smaller trees in the stands. The goal is to create an open stand with widely

spaced trees to stimulate growth of grasses, forbs, and brush species. In addition, the wide spacing and residual larger trees would increase the overall growth and vigor of the remaining trees and reduce the future mortality and susceptibility to insects, disease, fire, and wind. Emphasis would be on maintaining non-Douglas fir species. The wildlife thinning treatments would also produce increased vegetative diversity. This vegetative diversity would increase because opening the canopy would allow for in-growth of seedlings and understory shrubs, resulting in the development of early seral habitat. Large wood on the forest floor would be maintained or increased. Snags would be maintained on site if not a hazard to logging operations.

Oak Thinning

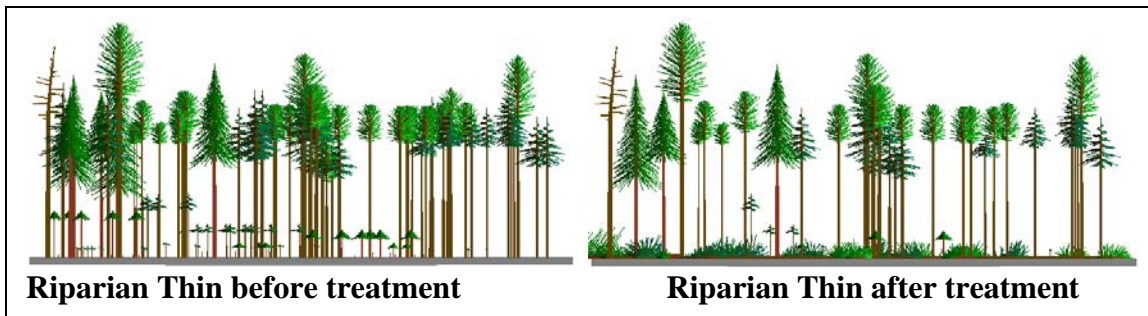
The oak thinning prescription is proposed for the stands where restoration of open oak savanna is desired. Both action alternatives include 30 acres of Oak Thinning and can be identified in Tables 2 and 5. The stands would be thinned to maintain 20-45% canopy closure and a post-treatment SDI of 17-24% of SDI^{max} . The goal is to remove trees that have encroached on the oak savanna habitat which has impacted regeneration of Oregon white oak (*Quercus garryna*). The wide spacing and residual larger trees would increase the overall growth and vigor of the remaining trees and reduce the future mortality and susceptibility to insects, disease, fire, and wind. Emphasis would be on maintaining Oregon white oak with Douglas fir as the primary cut tree. A follow-up broadcast burn would be applied to remove duff and slash. Cutting of trees and the follow-up underburn would help to promote oak regeneration. Snags would be maintained on site if not a hazard to logging operations.



Riparian Thinning

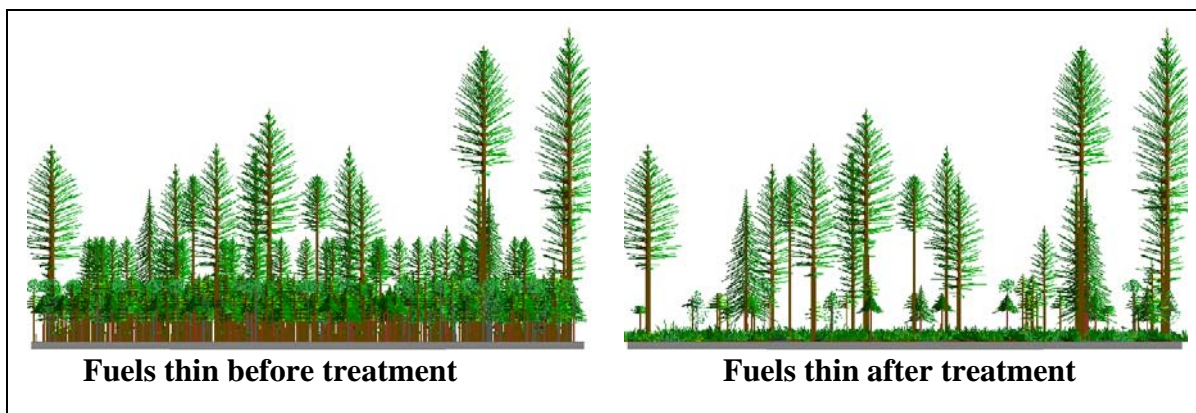
The riparian thinning prescription is proposed in riparian areas to maintain an average of 50% canopy cover. Alternative B has 145 acres of Riparian Thinning identified in Table 2. Alternative C has 137 acres of Riparian Thinning identified in Table 5. The stands would have a post-treatment SDI of 31-52% of SDI^{max} . Trees removed would primarily be the smaller diameter Douglas fir trees in the stands. The goal is to increase overall growth and vigor of the remaining trees and reduce the future mortality and susceptibility to insects, disease, fire, and wind. Emphasis would be on maintaining non-Douglas fir species. The creation of large woody debris for in-stream process would be accelerated by riparian thinning, which provides more growing space for the residual stand creation.

Large wood on the forest floor would be maintained or increased. Snags would be maintained on site if not a hazard to logging operations.



Fuels Thin

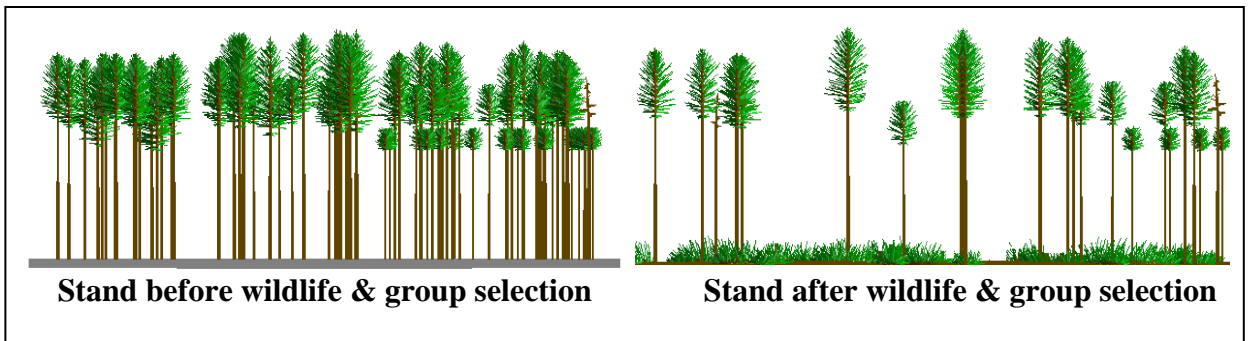
The fuels thinning prescription is proposed in units where no commercial product is to be produced. Alternatives B and C have 142 acres of Fuels Thins identified in Tables 2 and 5. The stands post-treatment canopy closure and SDI would have minimal, if any change due to the removal of sub-merchantable material. Trees removed would be the smaller diameter Douglas fir trees in the stands. The goal is to improve the stands fire resiliency by removing ladder and ground fuels, and to provide for firefighter safety by decreasing flame length. In addition the overall growth and vigor of the remaining trees would increase and the prescription would reduce the future mortality and susceptibility to insects, disease, wildfire, and wind. Large wood on the forest floor would be maintained or increased. Snags would be maintained on site if not a hazard to logging operations.



Group Select

This prescription would provide for gaps in the stands to increase diversity and forage. Both action alternatives include approximately 29 acres of Group Selects. Group selects would be placed in units 2, 3, 8, 10, 20, 40, 42, 43, 44, 45, 46, and 68. Group selects would be small holes approximately an acre in size, with the exception being in riparian areas where gaps would be no larger that 0.5 acres. All but the largest trees (4 per acre of the largest size class for the pocket) would be removed in these

gaps. Only one gap would be created for each 20 acres within a stand. Group selects would be randomly placed, unless a root rot pocket is identified. A 50' area surrounding root rot pockets would be cleared, resulting in the group select. Openings created by the removal of root rot pockets would not exceed 5 acres in size, and this is expected to be infrequent. Within the stand, another prescription (i.e. wildlife thin) would be applied to the area outside the group select. In the case of a root rot pocket, the group select may be larger than 1-2 acres depending on the size of the root rot pocket. Follow-up planting with species that are non-susceptible to the species of root disease may occur in root rot pockets. Large downed wood on the forest floor would be maintained or increased. Snags would be maintained on site, if not a hazard to logging operations.



Comparison of Alternatives _____

This section provides a summary of actions and the connected actions described above for each alternative.

Table 11. Comparison of Alternatives by Activity.

Management Activity	Units of Measure	Alt. A No Action	Alt. B	Alt. C
<i>Harvest Treatments</i>				
Moderate Thinning	Acres	0	391	377
Heavy Thinning	Acres	0	1,368	1,260
Wildlife Thinning	Acres	0	190	180
Oak Thinning	Acres	0	30	30
Riparian Thinning	Acres	0	145	137
Group Select	Acres	0	29 (acres not in total-	29 (acres not in total-

Management Activity	Units of Measure	Alt. A No Action	Alt. B	Alt. C
			encompassed in other prescriptions)	encompassed in other prescriptions)
Total Acres of Stands with Timber Harvest	Acres	0	2,256	2,079
Gross Estimates of Timber Output	(MBF/ CCF)	0/ 0	47,758/ 90,391	44,187/ 83,618
Total Acres of Timber Harvest in Stands >= 80 years old (not in Oak Thinning)	Acres	0	140	0
<i>Logging System</i>				
Ground-based	Acres	0	770	760
Skyline	Acres	0	960	830
Helicopter	Acres	0	520	500
<i>Fuels Treatment</i>				
Fuel Thins	Acres	0	142	142
Natural Fuels Underburn	Acres	0	51	49
Grappel Pile and Burn	Acres	0	397	397
Hand Pile and Burn	Acres	0	264	264
Underburn	Acres	0	1,266	1,133
<i>Roads</i>				
Road Maintenance	Miles	0	34.2	33.7
Open Roads Closed by Gates or Berms	Miles	0	0.2	0.2
Total Road Decommissioning	Miles	0	0.3	0.3
Temporary Roads	Feet	0	25,552	25,552

Comparison of Alternatives by Significant Issues

The following tables summarize detailed analysis presented in Chapter 3 on the effects of the alternatives.

Table 12. Comparison of Alternatives – Aquatics/Riparian Resources.

Issue Measurement	Units of Measure	Alternative A (no action)	Alternative B	Alternative C
<i>Issue #1: Water Quality/Aquatics Resources</i>				
<i>Indicator #1: Increase in Stream Water Temperatures</i>	Degrees Celsius	0.5° to 0.6°	0° from existing condition	0° from existing condition
<i>Indicator #2: Changes in risk of altered peak flows</i>	Aggregate Recovery Percentage (ARP)	88.31%	88.26%	88.26%
<i>Indicator #3: Sediment Yield During Project (Road Origin Sediment)</i>	Sediment Cubic yards	247	273	271
<i>Indicator #3: Sediment Yield After Project (Road Origin Sediment)</i>	Sediment Cubic yards	247	230	227
<i>Indicator #4: The amount of riparian area receiving thinning treatment.</i>	Acres treated/ Percentage of Riparian in the project area	0/ 0%	145/ 4.7%	137/ 4.2%
<i>Issue #2: Threatened Northern Spotted Owl</i>				
<i>Indicator #1: Suitable Owl Habitat</i>	Acres Downgraded*	0	0	0
<i>Indicator #1: Suitable Owl Habitat</i>	Acres Removed	0	0	0
<i>Indicator #2: Dispersal Owl Habitat</i>	Acres Removed **	0	228	218

*: Units 101 and 103 would be treated with a fuels reduction (non-commercial harvest) that would maintain suitable habitat.

** : Oak savannah restoration and wildlife thinning would remove dispersal habitat.