United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Eugene District Office
P.O. Box 10226
Eugene, Oregon 97440-2226

IN REPLY REFER TO:

1792A

EA 12-05

2014 Thinnings

November 25, 2013

Dear Citizen,

The Upper Willamette Resource Area of the Eugene District Bureau of Land Management has completed a new Environmental Assessment (EA) for the proposed commercial thinning harvest on approximately 1,567 acres in the Muddy Creek-Willamette River and Mohawk River 5th field watersheds.

This EA considers in detail three alternatives, the No Action Alternative (Alternative 1) and the Proposed Action (Alternative 2), and a third alternative incorporating helicopter harvest as a method for implementation (Alternative 3). The Proposed Action was developed to meet the purpose and need to produce a sustainable supply of timber to increase the proportion of merchantable volume, and promote development of desired understory vegetation (RMP, p. 200) in Matrix lands and to meet Aquatic Conservation Strategy (ACS) objectives (1995 ROD/RMP, p. 23) in Riparian Reserves. Project actions have been developed as a result of interdisciplinary review of the project area to identify management options and opportunities.

You have expressed an interest in receiving copies of EAs for our projects. This EA has been provided for your review and any comments. Public notice of this proposed action will be published in the Eugene Register Guard on December 4, 2013. The EA is also available on the internet at http://www.blm.gov/or/districts/eugene/plans/index.php. **The public comment period will end on January 3, 2014.** Please submit comments to me at the Eugene District Office by mail at 3106 Pierce Parkway, Suite E. Springfield, OR, 97477; or by e-mail at BLM_OR_EU_Mail@blm.gov by close of business (4:30 PM) on or prior to November 12, 2013. If you have any questions concerning this proposal, please call me at 541-683-6287.

Comments, including names and street addresses of respondents, will be available for public review at the Eugene District Office, 3106 Pierce Parkway, Springfield, Oregon, during regular business hours (8:00 AM to 4:30 PM), Monday through Friday, except holidays, and may be published as part of the EA or other related documents. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses and from individuals identifying themselves as representatives or officials of organizations or businesses will be made available for public inspection in their entirety.

Sincerely,

for:

William O'Sullivan
Field Manager
Upper Willamette Resource Area

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
EUGENE DISTRICT OFFICE

ENVIRONMENTAL ASSESSMENT
DOI-BLM-OR-E060-2012-0005-EA

1.0 INTRODUCTION

The Upper Willamette Resource Area, Eugene District BLM proposes to implement commercial thinning harvest on approximately 1,567 acres in the Muddy Creek-Willamette and Mohawk 5th field watersheds. Project actions would include timber harvest, and road construction, maintenance, and decommissioning. The project is tentatively proposed to be implemented through five timber sales[1], whose locations are as follows:

- Crooked Line T.15S., R.02W., Sections 10, 11, 15, 23 and 24
- Drury Combo T.15S., R.01W., Sections 13, 17, 22, 23, and 27
- McGowan Too T.16S., R.02W., Sections 17 and 33
- Middle Ridge T.15S., R.02W., Section 13
- North Parsons T.15S., R.02W., Sections 23, 26, 28, and 33

The Land Use Allocations for these acres are Matrix and Riparian Reserve.

1.1 PURPOSE AND NEED

The purposes of the action in thinning units in the Matrix are to produce a sustainable supply of timber to increase the proportion of merchantable volume, and promote development of desired understory vegetation (RMP, p. 34). The need for action in Matrix and Riparian Reserves has been established through the results of field reviews and stand examinations. In the areas proposed for thinning, the stands are dense, overstocked and uniform in structure. This results in reduced tree growth and stand vigor. Timber management through thinning is given priority in "well-stocked or overstocked stands where density reduction is needed to maintain good diameter growth rates," (RMP, p. 201).

The purposes of the actions in Matrix would also be to provide connectivity; provide habitat for a variety of organisms associated with both late-successional and younger forests; maintenance of valuable structural components, such as down logs and snags; and reduce the risk of stand loss from fire, animals, insects and disease (1995 ROD/RMP, pp. 34, 84).

The purposes of the actions in Riparian Reserves are to provide for the conservation of and habitat for special status species as well as other terrestrial species, and to meet Aquatic Conservation Strategy (ACS) objectives (1995 ROD/RMP, p. 23). Included in these purposes is the acceleration of late-successional characteristics, such as structural complexity.

Additional direction for road management directs us to provide and manage the road system to serve resource management needs (1995 ROD/RMP, p. 98).

1.2 CONFORMANCE

The 2014 Thinnings Project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Eugene District Resource Management Plan.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Rey, et al., No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Judge Coughenour deferred issuing a remedy in his December 17, 2009, order until further proceedings, and did not enjoin the BLM from proceeding with projects. Plaintiffs and Defendants entered into settlement negotiations that resulted in the 2011 Survey and Manage Settlement Agreement, adopted by the District Court on July 6, 2011.

[1] Timber sale names and acres under each are tentative. Final composition of acres proposed under each sale or total number of sales could change based on markets at time of sale advertisement, in response to public comments received, or to reduce impacts to resources.

The Ninth Circuit Court of Appeals issued an opinion on April 25, 2013, that reversed the District Court for the Western District of Washington's approval of the 2011 Survey and Manage Settlement Agreement. The case is now remanded back to the District Court for further proceedings. This means that the December 17, 2009, District Court order which found National Environmental Policy (NEPA) inadequacies in the 2007 analysis and records of decision removing Survey and Manage is still valid.

Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter "Pechman exemptions").

Judge Pechman's Order from October 11, 2006, directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

A. Thinning projects in stands younger than 80 years old;
B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and
D. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Following the District Court's December 17, 2009, ruling, the Pechman exemptions still remained in place. The 2014 Thinnings Project has been reviewed in consideration of both the December 17, 2009, partial summary judgment and Judge Pechman's October 11, 2006, order. Because the 2014 Thinnings Project includes no regeneration harvest and includes thinning only in stands less than 80 years old, the determination was made that this project meets Exemption A of the Pechman Exemptions (October 11, 2006, Order), and therefore may still proceed to be offered for sale even if the District Court sets aside or otherwise enjoins use of the 2007 Survey and Manage Record of Decision since the Pechman exemptions would remain valid in such case.

1.3 SCOPING

Scoping information about the 2014 Project was first provided in the Spring 2012 Eugene District Planning Update. A separate scoping letter for the project was also mailed to interested and affected parties in July 2012. The letter described actions proposed in the 2014 Project, and included specifications regarding a regeneration harvest in the Second Show timber sale. Over 700 comments were received in response to scoping efforts for this project. The vast majority of these comments raised issues exclusive to regeneration harvest.

To better present the issues directed towards thinning management proposed, and to not 'dilute' the issues raised with the thinning sales proposed, the analysis for these sales has been separated and will be presented to the public under two Environmental Assessments. This EA specifically discusses the issues, proposals, and effects of thinning management on stands less than 80 years old.

1.4 ISSUES

In the context of an environmental analysis, an issue is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. An issue:

- has a cause and effect relationship with the proposed action or alternatives;
- is within the scope of the analysis;
- has not been decided by law, regulation, or previous decision; and
- is amenable to scientific analysis rather than conjecture.

1.4.1 Issues Presented in Detail

Comments received during public scoping and the project Interdisciplinary Team (IDT) brought forward the following concerns related to resources that had potential of being affected by the proposed actions. The resource concerns related to the issues are presented in Section 3.0: Affected Environment and Environmental Consequences.

ISSUE 1: What are the effects of proposed actions on managed OHV trails and use?
ISSUE 2: What are the effects of proposed actions on soil capability and limitations?

ISSUE 3: What are the effects of proposed actions on coarse woody debris and snags?
ISSUE 4: What are the effects of proposed actions on watershed health?

1.4.2 Issues Considered, but Not Presented in Detail

Comments received during public scoping and the project IDT brought forward the following additional concerns related to resources that had potential of being affected by the proposed actions. Some of these issues have been raised on previous projects and analysis conducted has resulted in determinations of negligible impacts, which helped inform the IDT on the need for detailed analysis in this document. For other issues, the IDT conducted substantial analysis, including inventory and assessment, before concluding that no further analysis was needed. For reasons described below, these issues were not carried forward to be presented in detail.

What are the effects of the proposed actions on greenhouse gas emissions?
Carbon analyses have been completed for similar projects (i.e., commercial thinning in conifer stands 30-70 years in age). Those analyses have shown that, in total, the action would result in the emission of approximately 6,800 tonnes in the short-term and an additional 3,500 tonnes over the long-term, for an approximate cumulative total of 10,300 metric tonnes. This would equate to the emission of approximately 38,000 metric tonnes of carbon dioxide.

Over the next 30 years, continued forest growth following harvest would result in an increase in live tree stand volume of an average 40 cubic feet per acre, or approximately 59,000 cubic feet across the project area. This equates to an increase in storage of approximately 500 metric tonnes of carbon per year. Forest growth would equate to the sequestration of approximately 14,000 metric tonnes of carbon dioxide over the long term. In conclusion, forest growth 30 years following harvest would result in carbon storage which would exceed the carbon directly and indirectly emitted from harvest, resulting in a net storage of carbon compared to current conditions.

The carbon analyses are incorporated here by reference (2011 Thinnings Project DOI-BLM-OR-E060-0001-EA, pp. 25-26). Other analyses have shown similar results (Hills Camp EA DOI-BLM-OR-E060-2010-0003-EA, pp. 6-8; Long Tom Landscape Plan EA; DOI-BLM-OR-E050-2009-0006-EA, pp. 39-41). This proposed action would result in a similar magnitude of short-term carbon emission and long-term carbon storage as analyzed in those similar projects, because the forest stand conditions and treatments for this proposed action are approximately similar in terms of carbon implications. Because the proposed action would result in only a small amount of carbon dioxide emissions for a small period of time before stand regrowth would result in a net storage of carbon, there is no potential for a significant impact related to greenhouse gas emissions from the proposed action, and this issue does not require more detailed analysis.

What are the effects of the proposed actions on legacy tree structures within harvest units?
Although most of the stands being considered for treatment are second-growth even-aged stands, a few stands (northwest unit of Middle Ridge, McGowan Too 33, and Crooked Line 15) contain some patches of scattered larger trees that are distinguishable from the rest of the homogenous stand. For the 2014 Thinnings Project, clumps of older trees within younger stand types were identified by the Forest Operations Inventory, Stand Examination Data, and photo interpretation. Field verification was then conducted in order to determine whether a stand was still viable for thinning with the older tree component, and whether it was operationally feasible to access the areas in question. After field review, the legacy components were determined to comprise less than 20% of the total stand composition. Many of the larger tree component areas were then buffered out of the treatment area; however, a few individual trees remained in some units.

It was determined by the IDT foresters and silviculturist that these areas should remain in the sale area because of operational feasibility, and the infrequent occurrence of these trees within the stand as a whole. Further consideration by the IDT also recognized the importance of these legacy tree structures for other values such as wildlife habitat. Trees providing such habitat features are rare in the project area, and those that are known, such as these large legacy trees, would be painted with an orange “W” for explicit reservation. However, some of these trees could be felled for safety or operational reasons during harvest activities. Logging systems designed around known legacy tree structures were designed to minimize the potential need for this to occur to known legacy structure trees. Any unknown large remnant trees not painted with an orange “W” would generally be reserved from harvest through project design features (PDF #40), but could be felled where needed to accommodate logging systems, safety, or residual stand density targets. If any legacy structure trees are felled, they would be required to be left on-site for retention as coarse woody debris and would not be harvested (PDF #7). As such, it is likely that Alternatives 2 and 3 would result in localized loss of standing legacy trees in units where these trees exist through their conversion to large coarse woody debris.

What are the effects of the proposed actions on special status (threatened, endangered, & sensitive) wildlife?

The project area was analyzed for impact considerations on all applicable BLM Special Status Species and Migratory Birds. The following special status wildlife species could be potentially affected by the project: northern spotted owl, Cascades axetail slug, harlequin duck, American peregrine falcon, purple martin, fringed myotis and Townsend's big-eared bats, and the migratory birds band-tailed pigeon, Northern goshawk, olive-sided flycatcher, and purple finch. The project has the potential to affect seven known and three predicted northern spotted owl sites. A known peregrine falcon nest site is located adjacent to the McGowan Too 17 units.

Wildlife Habitat: Consideration of impacts to these species from proposed actions is largely driven by modifications to habitat characteristics and disturbance during operations. The proposed units are mid-seral stands regenerated after clearcut harvest; overstory trees are generally densely stocked and have crown ratios of 40% or less. The stands are dominated by Douglas-fir, with varying amounts of western redcedar and western hemlock; Pacific yew and grand fir are present but uncommon. Hardwoods are represented by bigleaf maple and scattered chinkapin and madrone. Large remnant trees are present in the northwest unit of Middle Ridge, McGowan Too 33, and Crooked Line 15. The proposed units are in stem exclusion stage, with understories of varying densities that are dominated by typical shrubs like hazel, oceanspray, and vine maple. Little advanced regeneration present for conifer species, and is primarily western hemlock and western redcedar. Some areas of thin soils and balds are present throughout the project area, with increased numbers of chinkapin and madrone.

All alternatives would eventually result in the development of late-successional characteristics like large-diameter trees, fissured/sloughing bark, deep crowns, large branches, multiple canopy layers, and cavities. However, the action alternatives would produce some of these desired characteristics decades sooner than the no action alternative. The action alternatives would also ensure that hardwood and minor conifer species would be retained and persist in the units (PDF #40). Timber harvest under the action alternatives would result in modifications to canopy closure and understory vegetation, resulting in short-term (10-15 years) adverse effects to species preferring dense canopies and understory vegetation for living or foraging. Permanent loss of habitat would occur through road construction, which would also increase habitat fragmentation and future human accessibility to proposed harvest units under the action alternatives. No-harvest buffers would be sufficient to protect habitat values in streams, seeps, or wetlands, although localized impacts to these values at newly constructed stream crossings would occur. Habitat modification to snags and coarse woody debris has been analyzed in detail and will not be discussed here (see Section 3.4).

Known Wildlife Sites: Under the action alternatives, one northern spotted owl site (74NEWITS) would receive treatment to a high percentage of the site's existing dispersal habitat, and a high percentage of the provincial home range (1.2 mile radius) has been thinned within the past 5 years. As a result, the action alternatives would be *likely to adversely affect* this site; however, the likelihood of occupation at this site is low due to current habitat conditions and therefore "take" of northern spotted owls is not expected.

Noise Disruption: While the action alternatives would create noise disruption through operations, project design features would be implemented creating seasonal operating restrictions for known or predicted sites associated with portions of Crooked Line 23 and North Parsons 23 for northern spotted owls, and the majority of McGowan Too 17 for peregrine falcons (PDF #1). Other potential disruption to wildlife would be mitigated through seasonal restrictions on helicopter operations (PDF #3), quarry operations (PDF #5), or other project activities (PDF #4).

Wildlife Populations: Analysis of these species and potential impacts from commercial thinning harvests have been completed for similar projects (i.e., commercial thinning in conifer stands 30-70 years in age) and are well understood (North Dorena EA DOI-BLM-OR-E060-2012-0001-EA, pp. 12-24; North Mohawk EA DOI-BLM-OR-E060-2011-0002-EA, pp. 16-26). The project design features incorporated into this analysis (Appendix A), such as seasonal restrictions for disturbance and protection of snags and coarse woody debris, have been implemented through past projects as mitigations against undesirable impacts that could result from harvest actions. With the implementation of these project design features, the potential for population-level adverse effects to wildlife species considered in this analysis is low.

What are the effects of the proposed actions on vascular and non-vascular plants, bryophytes, lichens, and fungi in the project area?

No known Special Status fungi sites exist in or near the project area. Consistent with BLM Information Bulletin No. OR-2004-145, pre-disturbance fungi surveys in proposed project areas are not practical and therefore not required. Consistent with the above Instruction Memo, protection of previously known fungi sites and other larger scale inventories, are adequate to assure that project level impacts to species would not contribute to the need to list species under the Endangered Species Act. Also, because project actions are consistent with "Pechman exemptions" (see Section 2.1); pre-project surveys for Survey and Manage species are not required and none

were conducted. None of these species are discussed further in this document.

Surveys for vascular plants, bryophytes and lichens were completed during the 2011 and 2012 field seasons. Nine plants were located, all but one within the Riparian Reserve or timber production capability classification (TPCC) where no-cut buffers would protect the plant and microclimate. The one species located outside of these protected areas, a special status lichen, would receive a 100 foot no-cut buffer to protect the existing plants and microclimate habitat. As all plants located within the project area would receive protection through avoidance/buffers, there are no discernible impacts to plant species, regardless of the alternative.

What are the effects of the proposed actions on the spread of invasive weeds?
Analyses of the effects of commercial thinning and road actions on the spread of invasive weeds have been completed for similar projects (i.e., commercial thinning in conifer stands 30-70 years in age). Those analyses have shown that, in total, the action would be expected to result in increases in populations with disturbance due to new areas of open ground and increased roading activity during project implementation. These actions can also provide a competitive advantage to weeds by reducing native vegetation. Weeds are most likely to exploit and maintain populations in disturbed areas along roads, forest edges, and larger openings within stands. Harvest actions have been found to also contribute to the size or location of weed populations by transporting seed and plants on vehicles and equipment. Analysis of inventories and assessments conducted for this project identified conditions and proposed actions were consistent with conditions and actions proposed in other analyses conducted in detail. Project design features and mitigations have been developed and implemented on past projects to reduce the incidence of size and location spreads. These mitigations would also be applied to activities considered in this analysis.

Other analyses of weeds have shown similar results (Hills Camp EA DOI-BLM-OR-E060-2010-0003-EA, pp. 29-31; North Mohawk EA DOI-BLM-OR-E060-2011-0002-EA, pp. 31-35). This proposed action would result in similar effects as analyzed in these similar projects, because the forest stand conditions and treatments for this proposed action are approximately similar in terms of existing conditions and anticipated implications. Because past proven mitigations would be applied to this project, the proposed action would not be expected to result in unanticipated introductions or spread of existing weed populations outside of known parameters. There is no potential for a significant impact related to the spread of weeds from the proposed action, and this issue does not require more detailed analysis.

What are the effects of timber harvest and associated activities on the attainment of ACS objectives?
Aquatic Conservation Strategy (ACS) objectives established with the Northwest Forest Plan include nine specific objectives that establish criteria for management within Riparian Reserves. These nine objectives direct the maintenance and restoration of aquatic habitat characteristics through management actions. Initial evaluation of this potential issue determined that some ACS objectives would be maintained (no change expected) under all alternatives, whereas effects on other ACS objectives had potential for effects differences between alternatives. A point-by-point response to the nine ACS objectives and how the alternatives impact them was conducted for this analysis and is captured in a combined analysis report titled “Evaluation for Consistency with Aquatic Conservation Strategy” which is hereby incorporated by reference.

Presented in this EA are not the nine ACS objectives, but rather information that interrelates to the ACS objectives as presented though issues for this project. Elements of ACS objectives presented in detail in this document include snags and CWD, watershed health, sediment delivery, and stream connectivity. These elements of the ACS objectives that would be meaningfully affected (water quality, sediment, etc.) through the specific issues identified related to those resources are presented in section 3.0. Affected Environment and Environmental Effects to the resources associated with other ACS objectives are not analyzed in detail because those resources would not be meaningfully affected or are not present in the project area.

2.0 ALTERNATIVES

The section describes the alternatives analyzed and considered through this project. Project Design Features associated to either or both of the action alternatives are presented in Appendix A.

2.1 ALTERNATIVE 1: NO ACTION

Under this alternative proposed project activities such as timber harvest and road construction would not occur. This alternative also serves as a baseline for comparison of environmental effects and demonstrates the results of not implementing proposed actions.

2.2 ALTERNATIVE 2: THINNING HARVEST

This alternative is designed to treat the forested stands by thinning to meet the purpose and need. Overall stand ages range between 33-73 years. Thinning would produce a residual basal area (BA) ranging from 130-170 square feet per acre (ft^2/ac).

Matrix Management
Thinning would occur on approximately 1,100 acres of upland Matrix lands (Table 2-1).

Stands would be thinned from below. Trees selected for harvest would mostly be intermediate and co-dominant conifers that are suppressed and of poor form. Typically, trees >24", minor conifers (incense cedar, western redcedar, grand fir) and deciduous/broadleaf species (madrone, chinquapin, cottonwood, big leaf maple, alder, oak, ash) would be retained; except where necessary to accommodate logging systems, safety, or harvest objectives to enhance larger dominant conifers (primarily Douglas fir and western hemlock). Larger trees of greater growth potential and wildlife value would generally be retained. This prescription would result in a stand with variable spacing between remaining conifers and hardwoods.

Table 2-1: Acres by LUA and sale.

Timber Sale Name	Matrix (ac)	Riparian Reserve (ac)	Total (ac)
Crooked Line	320	120	**440**
Drury Combo	148	89	**237**
McGowan Too	220	65	**285**
Middle Ridge	124	60	**184**
North Parsons	291	103	**394**
Total	**1,100**	**438**	**1,540**

Riparian Reserves
Silvicultural treatments would occur in the middle to outer edges (75 feet on non-fish bearing streams and 200/400 feet on fish-bearing streams) of most Riparian Reserves on approximately 440 acres (Table 2-1). Treatments in the Riparian Reserves have been designed to meet ACS objectives. Riparian Reserves were evaluated for the benefits of thinning and potential need for snag/coarse woody debris (CWD) creation. Riparian Reserves included in harvest units (from 75 foot no-cut buffer to 200/400 foot boundary) were reviewed and appropriate management was designated. This analysis also resulted in the identification of some stands where timber management was determined to not be of benefit to the Riparian Reserves or not achieve ACS objectives. These stands were removed from further consideration for harvest treatment.

Within Riparian Reserves, the majority of the acres would be thinned (Table 2-1) to a BA of 130-170 through commercial harvest. Post-harvest assessment would evaluate snags and CWD needs to meet ACS objectives within 3 years after harvest operations. Commercial harvest BAs were adjusted to provide for additional retention to create snags and CWD after post-harvest conditions are assessed that would not reduce stand densities and compositions below desired levels.

Logging Systems
Timber harvest would be accomplished with a combination of cable and ground-based logging systems. Table 2-2 shows the approximate range of acres per logging system. Details on logging methods are shown on maps in Appendix C.

Table 2-2: Acres by logging system and sale.

Sale Name	Cable		Ground-Based		Total (ac)[1]
	ac	%	ac	%	
Crooked Line	360-334	82%-76%	105-80	24%-18%	**440**
Drury Combo	120-91	51%-38%	145-117	61%-49%	**237**
McGowan Too	229-160	80%-51%	126-57	44%-20%	**285**
Middle Ridge	157-153	85%-83%	31-27	17%-15%	**184**
North Parsons	339-256	86%-65%	138-56	35%-14%	**394**
Total	**1,205-994**	**78%-65%**	**545-337**	**35%-22%**	**1,540**

[1] Ranges in logging systems are changes within total acres analyzed, not net increases in acres to be treated.

Roads
Road system management and road improvements would occur to support timber harvest activities as described below and detailed in Attachment B (Tables B-1 through B-2) and Attachment C maps:

Construction, Renovation, and Improvements: Approximately 27.5 miles of road would need renovation including adding crushed rock and culvert replacements and additions (Table B-2). There are approximately 0.6 miles of proposed temporary road construction and approximately 6.8 miles of proposed permanent road construction.

Road Decommissioning: Approximately 1.4 miles of road would be decommissioned (long-term/blocked). Actions may include entrances barricaded, slopes water-barred, stream and cross drains removed, stream channels restored, and drain dips constructed (Table B-1). Approximately 0.6 miles of road would be fully decommissioned (permanent/tilled). Actions, in addition to decommissioning (long-term) actions, may include tilling of road bed and/or slash or brush placement, and mulching and planting of native species in disturbed areas.

Culvert Replacements & New Installations: Approximately 6 in-stream (non-fish) culverts and approximately 1 in-stream (fish) culverts have been identified for replacement. In addition, between 58-76 cross drain culverts have been identified for replacement. New installation of approximately 5-10 cross drains would occur on newly constructed roads. One temporary (fish) culvert would also be installed for summer seasonal harvest operations.

All culverts ranked as high priority for replacement due to concerns for fish, hydrology or road safety would be replaced if affected by the selected action. Appendix Tables B-1 and B-2 depict the current and expected near future conditions of culverts and which types would be anticipated to be replaced.

2.3 ALTERNATIVE 3: HELICOPTER HARVEST

This alternative is designed to treat the forested stands by thinning to meet the purpose and need. Overall stand ages range between 33-73 years. Thinning would produce a residual BA ranging from 130-170 ft^2/ac.

Under this alternative, thinning is proposed using helicopter harvest on 27 acres in Middle Ridge and on the 86 acres in Crooked Line's Section 24 units. The Middle Ridge acres proposed would be additional acres from those considered under Alternative 2. Roaded access to these acres was determined to be infeasible; however, timber management of these stands is still needed. The Crooked Line acres proposed would be acres considered as cable harvest lands under Alternative 2. Helicopter harvest of these acres would eliminate the need to construct 1.3 miles of new rocked road and eliminate a stream crossing for a fish-bearing tributary.

Excepting these changes, all other actions described under Alternative 2 for the sales would be the same under Alternative 3. Descriptions below highlight where these differences occur with proposed management.

Matrix Management

Thinning would occur on approximately 1,127 acres of upland Matrix lands (Table 2-3). Stands would be managed the same as proposed under Alternative 2.

Table 2-3: Acres by LUA and sale.

Timber Sale Name	Matrix (ac)	Riparian Reserve (ac)	Total (ac)
Crooked Line	317	123	**440**
Drury Combo	148	89	**237**
McGowan Too	220	65	**285**
Middle Ridge	151	60	**211**
North Parsons	291	103	**394**
Total	**1,127**	**440**	**1,567**

Riparian Reserves

Thinning in Riparian Reserves under Alternative 3 would be the same as described under Alternative 2. Acres harvested would not change as the difference between acres for the alternatives is driven by accessibility to acres via differing logging systems and roading options, which do not alter acreage of Riparian Reserve proposals.

Logging Systems

Timber harvest would be accomplished with a combination of cable, ground-based, and helicopter logging systems. Table 2-4 shows the approximate range of acres per logging system. Details on logging methods are shown on maps in Appendix C.

Table 2-4: Acres by logging system and sale.

Sale Name	Cable		Ground-Based		Helicopter		Total (ac)[1]
	ac	%	ac	%	ac	%	
Crooked Line	334-274	82%-76%	105-80	24%-18%	86	20%-0%	**440**
Drury Combo	120-91	51%-38%	145-117	61%-49%	0	0%	**237**
McGowan Too	229-160	80%-51%	126-57	44%-20%	0	0%	**285**
Middle Ridge	157-153	85%-83%	31-27	15%-13%	27	13%-0%	**211**
North Parsons	339-256	86%-65%	138-56	35%-14%	0	0%	**394**
Total	**1,205-994**	**78%-65%**	**545-337**	**35%-22%**	**113-0**	**7%-0%**	**1,567**

[1] Ranges in logging systems are changes within total acres analyzed, not net increases in acres to be treated.

Roads
Road management would occur the same as described under Alternative 2 except that approximately 1.3 miles of new permanent road construction and associated stream crossings would not be built or installed to access the 86 acres of timber considered for harvest through helicopter.

2.3 ALTERNATIVES CONSIDERED, BUT NOT ANALYZED IN DETAIL

The following alternatives were considered by the IDT, but not analyzed in detail.

No Timber Management in Riparian Reserves
Past issues regarding timber management in the Riparian Reserve are well known and include concerns for attainment of ACS objectives, impacts to fish habitat, and impacts to water quality. In designing the proposed action, these past known issues were considered with of an alternative that would not harvest in all or most of the Riparian Reserves in the project area. However, this alternative was not analyzed in detail after interdisciplinary review and analysis of the Riparian Reserves identified that a majority of the Riparian Reserves could benefit from timber management through the acceleration of the development of late-seral characteristics. Of course, management of Riparian Reserves is complex and management is needed for multiple aspects, some of which timber extraction would likely impact unfavorably. Analysis determined that reasonable mitigations could be developed to address any unfavorable impacts and best manage the Riparian Reserves for all objectives.

To consider an alternative that would not manage Riparian Reserves would not meet the purpose of the proposed action in Riparian Reserves to provide for the conservation of and habitat for special status species as well as other terrestrial species, and to meet Aquatic Conservation Strategy (ACS) objectives (1995 ROD/RMP, p. 23) and was, therefore, eliminated from further consideration. Effects of roads on the associated issues presented are discussed in Chapter 3.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This chapter describes the affected environment and environmental effects, which presents the existing condition and anticipated effects of the resources related to the issues identified to be presented in detail. The presentation of the affected environment and environmental effects is organized by the issues.

The description of the affected environment is structured to support the understanding of the analysis of environmental effects presented. The amount of information in this chapter is proportionate to the importance, scope, and sensitivity of the environmental effects and is no longer than necessary to understand the analysis of environmental effects. Several resources that are not addressed in detail in this section are identified or described in Chapter 1 (see section 1.4.2). Additional information and analysis completed for this project is included in the project record, to which this EA is tiered.

3.1 ISSUE 1: WHAT ARE THE EFFECTS OF PROPOSED ACTIONS ON MANAGED OHV TRAILS AND USE?

3.1.1 Affected Environment

The proposed project area coincides with much of the Shotgun Off-Highway Vehicle (OHV) Trail System, a component of the area's Extensive Recreation Management Area (ERMA). The System is comprised of support facilities (i.e., Cascade View OHV Complex [CVOHVC], Crooked Creek Staging Site [CCSS]), authorized trails (32.9 miles) and intersecting roads linking trail segments to one another. The trail system is maintained for casual and organized motorized activities, although non-motorized uses of the trails (e.g., hiking, running, etc.) are allowed. Use of the trails is year round including the summer months when public use restrictions are put into effect due to higher fire danger conditions.

The System is one of 12 publicly managed inland OHV opportunities within the State of Oregon, and is one of only two managed by the Bureau of Land Management. Commercial recreational activities utilizing components

of the trail system are administered under Special Recreation Permit (SRP). The recently completed CVOHVC is a triplex facility containing a staging/picnicking area, beginner's riding loop and training site. This complex is the focus of the most recently authorized SRP involving use of the System issued to the Oregon Motorcycle Riders Association (OMRA) in conjunction with Emerald Trail Riders Association, a local riding club, for conducting monthly hands-on youth safety evaluation programs.

The System is located primarily on BLM lands, but utilizes roads shared with highway legal vehicles in places. Both BLM lands and adjacent industrial timberlands use several of these shared roads for operational needs in timber harvesting, including heavy equipment moving and timber log haul.

The nearest developed recreation site in proximity to the project area is Shotgun Creek Recreation Site (SCRS), the area's only fee site. It is open to the public May through October; however, during the remaining 6-month closure period, the public is permitted site entry to access approximately 7.0 miles of low-elevation hiking trails. Located within a 277-acre Special Recreation Management Area (SRMA), the day-use site is located along Shotgun Creek Road, approximately 16 miles northeast of the city of Springfield. The predominate road used by visitors to access the recreation site is Shotgun Creek Road (BLM Road 16-1-5). Recognized as the Eugene BLM's greatest revenue generating recreation fee site, fiscal year 2012's collections exceeded $12,000 through the sale of recreation use permits and fees collected via Special Recreation Permits administered for that site. Total visits recorded for SCRS were 8,756 during fiscal year 2012.

3.1.2 Environmental Effects

3.1.2.1 Alternative 1: No Action

Ongoing management of the Shotgun OHV Trail System would continue as currently occurring. Full public access and use of the System's trails, connecting roads, and support facilities would continue. Ongoing and planned trail maintenance and improvements would continue to be implemented as funding and staffing allowed. Continued management of industrial timber lands in the vicinity would continue to result in presence of log haul trucks and other heavy operational machinery.

3.1.2.2 Alternative 2: Thinning Harvest

Direct impacts to be realized to the Shotgun OHV Trail System as a result of proposed harvest activities are focused primarily within the following harvest units: Crooked Line 10, 15, 23, and 24; Middle Ridge 13; North Parsons 23, 26; and Drury Combo 17. Within these project locations, 4.58 miles of designated trails would coincide directly with proposed cable or ground-based logging system activities within sale units. Of this quantity, 1.91 miles of trail would potentially be used as "skid" trails within ground-based units; 2.05 miles of trail could be impacted by corridors and landings within cable-based units. Additionally, 40% (13.3 miles) of the total System mileage would be closed during sale operations for user safety, as trail closure would be initiated at subject trail access points.

Project design features (PDFs) have been developed to reduce these impacts, either by reducing operational time for harvest or requiring reconstruction of trails damaged by harvest operations. Proposed trail reconstruction of all impacted trails post-harvest using appropriate mechanical and/or manual tools would ultimately provide restoration of the System's desired utility as a motorized recreation opportunity. The timing of such would differ depending upon the length of the contracted harvest periods. The reduced (18-month) contracted harvest period proposed for Middle Ridge 13 and portions of North Parsons 23/26 would minimize the duration of trail impacts to recreational resources and trail enthusiasts. In contrast, all other impacted trails would be subject to the traditional 3-year contracted harvest period. Middle Ridge 13 and portions of North Parsons 23/26 were identified for these timing specifications as work in these units would impact primary east-west connector trails and connection of the two System OHV facilities.

Resulting from interruption of trail connectivity due to trail closures, the utility of the System's support facilities, Crooked Creek Staging Site and Cascade View OHV Complex, would be compromised during proposed harvest operations; thereby promoting the likely increased establishment of informal, user-created unloading/loading sites that are neither managed nor designed for visitor health and safety throughout the authorized trail riding area. Almost 7 miles of trail would be inaccessible from either OHV support facility and would require such vehicle unloading/loading site establishment on behalf of the operator or driving along logging haul routes from the support facility to access open trails. Similarly, 13.1 miles of trail would only be accessible via a single support facility (5.0 miles, Crooked Creek Staging Site; 8.1 miles Cascade View OHV Complex) and would require the operator to access more distant open trails by operating All-Terrain Vehicles (ATVs) along logging haul routes or re-loading ATVs onto a transport vehicle and driving to the other support facility to unload and access open trails within proximity of that support facility.

Multiple haul routes planned under this project link to 2 primary travel ways, BLM Roads 15-1-19 (Crooked Creek

Road) and 16-1-5 (Shotgun Creek Road), which intersect the core of the Shotgun OHV Trail System. Newly-constructed, permanent rocked roads proposed as part of this project would link to, or intersect, several OHV trails throughout the planning area. Some of these roads are planned to be blocked at trail intersections upon harvest completion (i.e., MR13B, NP26A, NP26B); others are not (CL14A, DC17A). In one instance, a newly-rocked road (i.e., CL10C) is planned over part of an existing trail.

Proposed road renovations and new road construction designed for timber haul would further impact the trail network by the creation of 31 new trail/road intersections: 22 linked to proposed renovations; 9 linked to proposed construction. Further, 0.27 mile of trail-to-road conversion would result where proposed new road construction overlaps with existing trail in Crooked Line 10. With the exception of proposed Spur DC17A (Drury Combo 17) and Spur CL14A (Crooked Line 23), all created trail/road intersections would be blocked post-harvest with available logging slash, logs and brush on either side of the restored trail post- harvest. Consequently, with the exception of the intersections created by the establishment of Spurs DC17A and CL14A, reconstructed trail tread protection and trail definition would result.

Visitor safety risks would increase throughout the duration of the project primarily because of increased street-legal and non-street legal use of project roads used for harvest and recreational access. Potential conflicts between recreationists and loggers would arise simply due to added logging/road traffic tied to the proposed harvest, and the related, "closed" trails and location of fewer "open" trails within the project area requiring considerably more road use by ATV operators. Proposed signing aimed at cautioning visitors of road- and trail-related hazards that would be installed along key roadways, involved trails, the two OHV support facilities and Shotgun Creek Recreation Site would mitigate this safety concern.

3.1.2.3 ALTERNATIVE 3: HELICOPTER HARVEST

The effects described in Alternative 2 would be the same under Alternative 3 excepting the implications of the proposed helicopter landing sites at the Crooked Creek Staging Site and the intersection of Trail 1A and 28. General characteristics anticipated with the proposed type of landing/logging activity include an average size of ¾ acre, up to 1 month exclusive use of the site, and an operational impact period during winter months. Combined, these characteristics would present the greatest negative impact to the recreating public at the Crooked Creek Staging Site. In which case, closure of the site to public use would be required for safety reasons throughout the duration of the harvest activity for which the landing is required. Additionally, capital improvements associated with the site (e.g., picnic tables, loading ramp, vault toilet building, fire rings, sign boards, etc.) would be at increased risk of damage due to this type of activity that was neither intended nor accounted for in the design of this highly popular OHV support facility. However, any damage to site facilities would be required to be repaired or replaced at the cost to the operator, and would be expected to be completed prior to re-opening of the site.

3.2 ISSUE 2: WHAT ARE THE EFFECTS OF PROPOSED ACTIONS ON SOIL CAPABILITY AND LIMITATIONS?

3.2.1 Affected Environment

All project area sections exhibit some level of impact to soil function from past harvest. The current extent of detrimental soil conditions (severe compaction, severe displacement, or active erosion) varies in response to differing treatment history and soil sensitivity. Many deeply excavated skid roads at close spacing, some with rock additions, are still evident in the steeper terrain in Middle Ridge Section 13, Drury Combo Section 17, and North Parsons Section 28. Gradual terrain shows evidence of less excavation, but moderate and severe compaction is more widespread throughout entire units. Although it is difficult to quantify the spatial extent of existing residual compaction, estimates were derived from LiDAR imagery and field visits. All treatment stands received field visits from the earth scientists (hydrologist, hydrologist technician, geologist, or soil scientist) and others; most were visited by earth scientists at least three times, during different seasons, specifically to identify wetlands, wet soils, low productivity soils, areas impacted by past harvest, areas of instability, and accuracy of the soil mapping.

Dominated by deep, clay-rich soils, Crooked Line Sections 10, 15, and 23 and sections within the Drury Combo sale all have severe residual compaction and displacement (topsoil loss) occupying more than 5% of the proposed treatment areas. Shallow, loamy, and skeletal soils in North Parsons Section 33 are experiencing active surface soil erosion in areas where past-harvest cable corridors are still evident on the landscape.

Designated OHV trails and unauthorized OHV cross-country travel routes throughout the project area are compacted and incised with few effective drainage diversions. Water is channelized down the tread during winter rains. Grades over 15% have become severely rutted and eroded. Mobilized soil is supplied to ditchlines and delivered as sediment to connected streams. Direct sediment delivery from unauthorized OHV cross-country travel routes is most pronounced in Crooked Line Sections 15 and 23, and Drury Combo Section 17.

Field inspection during sale planning provided verification of the Lane County Soil Survey and Linn County Soil

Survey. These soils were then mapped and identified for capability, limitations, and resiliency. Five mapped groups with sensitivity to these are present in the project area (Table 3-1):

1. *Rock outcrop group. These areas are field verified and withdrawn from the project area.*
   Soils on these sites have low inherent productivity and are excessively drained. Soils have very low available water holding capacity (AWHC) and are subject to being dry for long periods during the growing season. Soils are shallow and skeletal, typically less than 14 inches total depth, with high coarse fragment content. These sites require, for the most part, protection, and offer minimal opportunities for manipulating the surface vegetation without impairing inherent physical and chemical capabilities, hydrologic function, and natural rates of erosion. Disturbance further reduces long-term soil productivity. The losses cannot be mitigated, even with application of BMPs.
2. *Hydric soils/wetlands. These areas are field verified and withdrawn from the project area.*
   These soils are very poorly or somewhat poorly drained and are on the Oregon Hydric Soils List. Water is present in the upper 12 inches for much of the growing season as evidenced by mottles (redoximorphic features). Permeability is very slow. Native vegetation consists of red alder, willow, sedges, with some western redcedar, western hemlock, and Douglas-fir. Effective rooting depth for conifers is limited by the high water table and high clay content of the subsoil. Trees are subject to windthrow during periods of heavy rainfall and strong winds. Hazard of windthrow is particularly high for trees 20 to 30 years old. Conifer trees are unable to survive on these sites except on scattered hummocks or mounds with better drainage. These soils are easily damaged by roading and timber management activities due to the high water table, leading to reduced function and long term site productivity.
3. *Seasonally high water table soils.*
   These sites have seasonal high water tables at depth of two to three feet and moderately slow permeability. Root growth tends to be more horizontal than vertical because of the saturated subsoil which makes trees highly susceptible to windthrow. These are poorly drained sites, usually depressions adjacent to streams or unstable areas where the water table is near the surface much of the year. The narrow window for dry soils on these sites presents a high risk for impacts, especially deep compaction. The sites may or may not contain water tolerant species, but removal of trees can reduce transpiration rates. Yarding may disrupt surface water flows. This can raise the water table and increase the time soils are wet, which could reduce production and change the adapted species.
4. *Soils with excessive coarse content.*
   Stone and cobble content can exceed 60% throughout the soil profile. Vegetative recovery is very slow for existing routes. Compaction of soils with excessive coarse content cannot be effectively ameliorated with standard tillage equipment.
5. *Soils that are slow to dry.*
   Most project areas are dominated by deep soil types with high clay content throughout, often greater than 50% in the subsoil, and few coarse fragments. Due to moderate slow permeability, these soils are generally dry less than 45 days between July and October in six out of ten years. Soil moisture content on these sites often will not draw down to recommended soil moistures (25%) that provide resistance to compaction. Gradual slopes, broad ridges, north and east aspects are particularly slow to dry.

Table 3-1. Mapped soil types with resiliency by sale.

Sale/Soil Type	% of Sale Area	Mapped Group	Risk Against Resiliency
Crooked Line			
Blachly clay loam	31%	5	High
Blachly-McCully clay loams	21%	5	High
Klickitat-Harrington complex	15%	4	Mod
Harrington-Klickitat complex	4%	4	Mod
Klickitat stony loam	1%	4	Mod
McCully clay loam	1%	5	High
McAlpin silty clay loam	<1%	3	Mod
Drury Combo			
Blachly-McCully clay loams	33%	5	High
McCully clay loam	10%	5	High
Cumley silty clay loam	9%	3	High
Blachly clay loam	7%	5	High

Sale/Soil Type	% of Sale Area	Mapped Group	Risk Against Resiliency
Klickitat stony loam	1%	4	Mod
McGowan Too			
Klickitat stony loam	30%	4	Mod
Blachly-McCully clay loam	18%	5	High
Honeygrove silty clay loam	14%	5	High
Cumley silty clay loam	2%	3	High
Middle Ridge			
Blachly clay loam	83% (Alt. 2) 79% (Alt. 3)	5	High
McAlpin silty clay loam	1%	3	Mod
North Parsons			
Blachly-McCully clay loams	16%	5	High
Klickitat-Harrington complex	9%	4	Mod
McCully clay loam	8%	5	High

* Percent acreage of sales does not total 100% for any sale, as this table displays percentage of soils present with limitations for resiliency and capabilities.

Reviews of the District's existing Timber Production Capability Classification (TPCC) System were also conducted in developing project proposals. TPCC is a soil based classification system designed to identify sites that are incapable of sustained intensive timber production without loss of long term productivity potential. Shallow skeletal (rocky) soils with low inherent productivity and resiliency, saturated soils (hydric/wetlands), and landslide prone sites are the primary categories. Existing TPCCs were visited in the field to get accurate geospatial information on shapes and sizes of the exclusion areas, as well as field verify the TPCC's existence. Newly located TPCCs were also incorporated into available geospatial information for the project and removed from harvest-base lands. All new TPCCs identified were smaller than 5 acres.

3.2.2 Environmental Effects

3.2.2.1 Alternative 1: No Action

No additional compaction or displacement would occur due to harvest and road management actions. Harvest areas with residual compaction in excess of RMP standards would continue to impair water storage. Legacy compaction and reduced soil productivity would persist into the future along existing skid roads and trails.

3.2.2.2 Alternative 2: Thinning Harvest

The majority of thinning proposed in the project area would occur on sites with high and intermediate resiliency soils. These soil types can sustain substantial manipulation and still maintain nutrient capital, inherent physical and chemical properties, hydrologic function, natural rates of erosion, and pre-treatment capabilities for tree growth. Project design features would minimize the potential for accelerated erosion through all phases of operation. Hydric soils and most soils with low resiliency were excluded from proposed harvest units and surface disturbing activities. No harvest or road building is proposed in areas identified as high potential for slope failure and accelerated mass movement. Fragile soils are also withdrawn from the productive timber base (through the TPCC process). Alternative 2 would operationally extract timber either through winter cable-yarding or summer (dry season) ground based harvesting (Table 2-3).

Cable yarding

Direct effects of cable yarding include displacement of surface soils and organic matter and discontinuous localized compaction and erosion within yarding corridors. The effects are typically confined to a strip less than 12 feet wide. When topography permits, independent corridors with settings 150 feet apart would be required. Under this design, bare soil subject to compaction, displacement, and erosion would occupy approximately 3% to 6% of individual treatment areas, dependent on landing size. Where ridge settings are necessary, lateral yarding in excess of 75 feet on steep slopes with coarse textured soils can lead to greater soil exposure and increased potential for accelerated erosion. Compaction would be deeper and more continuous for areas harvested in the winter when soils are wet. Compaction reduces porosity, which is an essential component of soil productivity for conifer growth. It is instrumental for water infiltration, water storage, and gas exchange. Soils with good porosity create favorable conditions for root growth, water movement, nutrient uptake by roots, and mychorrizal growth (Amaranthus, 1996).

Whole tree yarding increases the areal extent and severity of compaction and displacement within corridors as well as roadside landings. Whole tree yarding, which removes fine organic debris from the forest floor, has the potential to reduce soil productivity for conifer growth. Leaving woody residue and surface organic matter on site

protects mineral soil from detrimental compaction; it also reduces erosion and maintains soil nutrition (Han-Sup, et al., 1991). Approximately 80% of the available nitrogen for tree growth is contained in the needles and fine twigs (Stevens, personal communication), which may affect future tree growth. Areas implementing harvest allowing whole-tree yarding would likely exceed the 10% objective (PDF #54) though aerial extent of soil disturbance, both compaction and displacement.

With the implementation of project design features that limit the spatial extent and severity of compaction, bare soil exposure and measureable compaction in corridors and associated landing after harvest actions would be expected to occupy about 6% of the cable yarded areas, or 60 to 70 total acres. Full vegetative recovery is expected in less than 20 years for moderately resilient soils and within 5-10 years for highly resilient soils (Table 3.2). Cable yarding through shallow low productivity soils in North Parsons Unit 33D would displace limited surface soils causing reduced productivity and accelerated erosion in the long term within the corridor that would be needed inside the edges of 5 acre TPCC.

Ground-based yarding

Ground-based yarding is planned in treatment areas with suitable soils, which also have slopes less than 35 percent. Small areas where slopes exceed 35 percent occur in many ground-based yarding treatment areas, sometimes on slump terrain, a product of ancient instability. McGowan Too 33 is an example of this terrain. In this type of terrain, equipment would sit above or below the slope breaks and not travel on slopes exceeding 35%. These steeper slopes are typically shorter than 100 feet. Combining winching and directional felling can be used to prevent excavation of skid trails on steeper portions of ground-based yarding treatment areas, as supported by the project design features and contract stipulations. Some areas considered for optional harvest methods lend preference from the perspective of protection of soil capability and limitations to one system. Drury Combo 13 is an example of this. Cumley soils in DC13A are perennially too moist to allow ground base logging without substantial compaction occurring at depth, beyond the reach of standard decompaction equipment. Conducting decompaction treatments at higher moisture contents does not meet objectives; rather than achieving the desired mix of aggregate sizes, only large massive clods are created. Ground based trafficking on these 10 acres would reduce water storage and increase runoff rates. Given the legacy of past impacts in the Drury Combo units and the sensitivity of the soils contained it is reasonable to expect that even after amelioration, severe compaction would occupy about 10% of the ground based portions. Long term soil productivity would be impaired for the next rotation and beyond.

Areal extent and severity of compaction would vary depending on the amount and distribution of surface litter and slash, soil texture and structure, percent soil moisture, and the weight and function of the machinery employed by the operator. Studies have concluded that after six yarding trips most soil textures would become compacted to the point that bulk density is increased and soil function is impaired (Steinfeld, 1997). After that point, a higher traffic frequency on the same trail doesn't necessarily increase the compaction level. Travelling on slash mats when operating off of designated skid trails would effectively mitigate bulk density increases when cut-to-length processors are operating off of designated skid trails by providing a reservoir of organic material that can be incorporated into the surface layer by mixing action of tracks and tires and by acting as a pressure absorbing layer (McDonald, 1997).

Only existing skid trails are recommended for use on rocky soils. However, use of some OHV trails (Trail 12, Trail 8) could increase sediment delivery to adjacent streams. Skid trails, both existing and new, placed on soils with high coarse content (See Group 4 description) would result in localized compaction that cannot be effectively ameliorated with standard tillage techniques. After harvest, about 15% of the ground based units, from 50 to 80 acres, would be occupied by skid trails and landings. The spatial extent of severe compaction within the 15% footprint would vary considerably, depending on the variables discussed above. For purposes of this analysis it is assumed that at least 20% of the skid trail design used in this entry would be legacy trails, all of which would need to be decompacted. The growth loss standard of 2% in Eugene District RMP (1995) assumes 98% treatment effectiveness (at that time subsoilers employed after final harvest). Effective decompaction with this type of equipment would restore infiltration and hasten vegetative recovery. Utilizing old routes would reduce new adverse impacts and provide the opportunity to treat residual effects. Localized areas where the spatial extent of compaction is reduced would improve long term soil productivity for conifer growth. However, given the legacy of past impacts and the sensitivity of soil contained in the Drury Combo units planned for ground based systems, it would be unlikely to achieve effective amelioration, and severe compaction would be expected to occupy about 10% of the ground-based harvest units. The aerial extent of compaction in the Crooked Line harvest units would also be expected to occupy about 10% because of past management activities and the increasingly high level of use on designated OHV trails.

Road Construction

Approximately 6.8 miles of permanent rocked road would be constructed. Long term soil productivity for conifer growth would be irreversibly lost on about 25 acres of forested land, regardless of current soil capabilities and limitations. Many of these rocked roads are short in length and intended for short term use, then would be blocked and rendered erosion resistant after harvest (winterization).

Approximately 0.6 mile of temporary native surface road and associated landings are planned to facilitate ground based logging systems. This would result in the loss of topsoil, severe compaction and severe displacement on about two acres of productive forest land within ground based units. In general, the temporary roads are planned on gradual grades and tillable soils.

Improvements to harvest machinery capabilities in recent years have changed operational abilities of on-site harvest operations. Activities previously only capable of being achieved by large machines in sorting yards are now able to be conducted at landings. This has resulted in different uses of roads and landings, including roadside log decking, sorting, and processing on the landings (APS 2010). This change in use in recent years has changed impacts to soils on native surface roads, surfacing on rocked roads, and at landings. Increased compaction along roadsides has been seen through monitoring resulting from roadside decking of logs. Long continuous log decks often stay in place for long time periods and can inhibit drainage function. Processing logs produces a large quantity of bark and slash in the road which acts as mulch.

All native surface roads used in this entry would be decompacted during the dry season immediately following logging operations in accordance with PDFs and BMPs. Woody debris and slash would be placed on tilled surfaces to enhance future soil productivity and block unauthorized vehicles.

The portion of native surface road in Drury Combo Unit 13A located on Cumley soils would remain moist during summer operations. Soil would be deformed, sheared, and severely compacted. Decompaction would not be effective due to the persistent high moisture content and depth of compaction.

Installation and haul over two temporary culverts on Road No. 15-1-15.2 would likely produce clay rich fine sediment delivery to the fish bearing stream on the west side of Drury Combo Section 23. Harvest of the area accessed over this crossing would be expected to be able to be accomplished in one summer season; however, too many variables of weather and other external conditions at time of harvest potentially exist to assume this a certainty. It would be likely that impacts from this road and crossing would span more than one season. Stream-crossings would be temporary and would be removed as part of winter preparation for the unit and re-installed the following season. Sediment pulses would occur during four operations; four culvert installations and four removals. These pulses would be expected to produce short-term detrimental impacts to the stream during each installation and removal.

3.2.2.3 ALTERNATIVE 3: HELICOPTER HARVEST

The effects of proposed actions on soil capability and limitations under Alternative 3 would be the same as described above, except for portions harvested with helicopters. Alternative 3 would implement helicopter harvest rather than cable systems on 86 acres in Crooked Line Section 24 (Table 2-5). Yarding with helicopters would result in negligible effects to soil long term productivity. Detrimental displacement and compaction would occupy less than one percent of the harvest unit (Long Term Productivity Study, Siskiyou National Forest, 1996). 1.3 fewer miles of permanent rocked roads would be constructed, leaving 4.5 acres of productive forest soil in Crooked Line Section 24 available for future conifer growth.

3.3 ISSUE 3: WHAT ARE THE EFFECTS OF PROPOSED ACTIONS ON COARSE WOODY DEBRIS AND SNAGS?

3.3.1 Affected Environment

Coarse Woody Debris (CWD) is an important habitat feature for many wildlife species. CWD provides refugia, foraging sites, and travel corridors for species with low mobility and small home ranges (e.g., invertebrates, small mammals, and amphibians). Additionally, CWD provides important basic ecological function like moisture retention, nutrient cycling, and microclimate buffering. Amounts of CWD and snags are low compared to typical unmanaged stands of similar age. Due to previous harvest, site preparation, and lack of subsequent tree mortality the CWD present is generally either large-diameter/high decay class residue from the initial harvest or small diameter/low decay class suppression mortality. Field review of the proposed units indicates that CWD is more regularly distributed in Riparian Reserves and irregularly distributed in upland areas; with the greatest amounts present in Riparian Reserves.

CWD and snag data collected during stand exams indicate that amounts of CWD vary widely among the proposed harvest areas. However, because sample transects were placed based on preliminary unit boundaries, and samples from several units were pooled, the resulting figures should be used only very generally.

The proposed units contain an average of 836 linear feet per acre of CWD at least 4" DBH. As is typical in managed stands of this age, the CWD is composed primarily of recent, lower decay class, smaller diameter suppression mortality; older, higher decay class, large diameter pieces comprise the remainder.

Coarse woody debris and snags of decay class 3-4 that is ≥20" diameter provides the best currently available wildlife habitat features. Proposed harvest areas contain an average of 99 lf/ac of such CWD, generally as residue from the previous harvest.

Hard CWD provides much less function for wildlife and generally represents potential future wildlife habitat after further decay. Most of the low decay class CWD has been recruited in the past few decades and is of small diameter. Proposed harvest areas contain approximately 185 lf/ac of decay class 1-2 CWD that is > 16 inch diameter.

Snags are especially important to primary and secondary cavity nesting birds (songbirds, woodpeckers, owls) and roosting bats. Stand exam data show an average of 1.3 snags per acre in the proposed units. However, more than 75% of these snags are in small diameters (4-15" DBH) that do not provide the variety of wildlife life history needs that large snags do, because of their small size and/or short lifespan. Large, moderately decayed snags are most important to wildlife. Stand exam data show only 0.3 snags per acre that are 16 inches diameter or greater.

3.3.2 Environmental Effects

3.3.2.1 Alternative 1: No Action

Existing CWD and snags would not be physically degraded or removed, nor would their quality or function change due to alteration of surrounding microclimate. Stands would continue to recruit small to medium-sized CWD and snags, primarily through suppression mortality. Existing large-diameter CWD and snags would continue to decay and disappear from the stand. These features would not be replaced until natural processes created the necessary growing space for the development of large-diameter trees.

3.3.2.2 Alternatives 2 & 3

Harvest operations would damage some down logs (particularly those in advanced decay classes), and some snags could be felled for safety reasons or be inadvertently knocked over. Changes in microclimate due to overstory removal could also adversely affect CWD and snag function and quality until stand canopy conditions recover in 10-15 years. In addition to damaging some existing CWD and snags, thinning would remove trees that would soon suffer suppression mortality and become functional snags or down wood; and existing material would disappear from the stands as decay continues. As a result, less CWD and snags would be recruited in the project area when compared to the Alternative 1. Additionally, further snag and CWD recruitment would likely be postponed until decades in the future because residual trees would continue vigorous growth, although sporadic mortality from wind, disease, or insects would occur.

Alternatives 2 and 3 include project design features to mitigate these impacts. Snags and CWD would be created from reserve trees throughout the treated portions of Riparian Reserves to partially mitigate this effect. All trees marked for retention within the Riparian Reserve would remain on site, if cut for any reason. Retention of unthinned riparian buffers and deferred areas in and around the proposed units would also moderate this effect at the project scale. And project design features would retain existing CWD decay classes 3-5 and snags in proposed units. However, the overall effect of Alternatives 2 and 3 on snag/CWD dynamics would be to prolong the low level of recruitment in the proposed units.

3.4 Issue 4: What are the effects of proposed actions on watershed health?

3.4.1 Affected Environment

The 2014 Thinnings Project is located northeast of Springfield, Oregon; mainly in the Mohawk River watershed within the McKenzie River subbasin, and an additional 30 acres are located within the Upper Willamette River subbasin. Table 3-2 further illustrates hydrologic unit code (HUC) divisions (5^{th} field watersheds and 6^{th} field subwatersheds), unit locations within those areas, and downslope streams. The Mohawk/McGowan Watershed Analysis encompasses the entire project area. The BLM lands located in the Muddy Creek watershed were characterized in the Mohawk/McGowan Watershed Analysis (BLM 1995) as lands referred to as the "Coburg Fringe". The project area is also under guidance from the Willamette Basin Water Quality Restoration Plan.

Table 3-2. Timber Sale Unit Name, HUC, and Nearby Named Streams.

Watershed Name HUC 10	Subwatershed Name HUC 12	Proposed Harvest Unit Name	Nearest Named Stream (distance from unit)
Mohawk River 1709000406	Headwaters Mohawk River 170900040601	Drury 13	Mohawk River (0.75 mile)
		Drury 17	Drury Creek (adjacent)
		Drury 23	Mohawk River (0.42 mi)
		Drury 27	Mohawk River (0.34 mi)
	Shotcash Creek-Mohawk River 170900040602	Drury 17	Seeley Creek (0.21 mi)
		Crooked Line 10	Crooked Creek (headwaters adjacent)
		Crooked Line 11	Owl Creek (adjacent)
		Crooked Line 13	Owl Creek (adjacent) Shotgun Ck (adjacent)
		Crooked Line 15	Crooked Creek (adjacent)
		Crooked Line 23	Crooked Creek (adjacent)
		Crooked Line 24	Crooked Creek (adjacent) Shotgun Creek (adjacent)
		North Parsons 23/26	Crooked Creek (0.15 mi) Shotgun Creek (>1.0 mi)
		North Parsons 28/33	Perkins Creek (>1.0 mi)
	Parsons Creek-Mohawk River	North Parson 28/33	Parsons Creek (adjacent)
	McGowan Creek-Mohawk River	McGowan Too 17	Allison Ck headwaters(adj) McGowan Creek (0.75 mi)
		McGowan Too 33	McGowan Creek (0.38 mi) Mohawk River (2.0 mi)
Muddy Creek-Willamette River 1709000306	Little Muddy Creek 170900030607	Crooked Line 10	Pierce Creek (>1.0 mi)

Approximately 42 miles of stream exist within or are adjacent to the project areas. Most of these are perennial or intermittent first, second, or third order streams. Additionally, 41 other hydrologic features were identified during field surveys, including springs, seeps, sag ponds, waterfalls, and wetlands.

Approximately 23% of the Mohawk River watershed area is managed by the BLM. Riparian Reserves within the project area comprise approximately 6% of the total BLM managed Riparian Reserves in the watershed.

All project area sections have relatively high road densities, as shown in Table 3-3. Watersheds with road densities of 2-3 miles per square mile (mi/mi^2) with some valley bottom roads are considered “at risk” and road densities of >3 mi/mi^2 with many valley bottom roads as “not properly functioning” with respect to a variety of factors influencing water quality and the timing of peak flows (NMFS, 1996).

Table 3-3. Project Area Road Density.

Scale	Road Miles/mi^2 *
Mohawk River Watershed	4.6
Headwaters Mohawk River Subwatershed	5.1
Shotcash Creek-Mohawk River Subwatershed	4.7
Parsons Creek-Mohawk River	4.2
McGowan Creek-Mohawk	4.1
Little Muddy Creek	2.3

*Based on GIS analysis of BLM Corporate data for known existing roads/prisms. Actual road densities are slightly higher due to data gaps for skid trails on federal and non-federal lands and road/prisms on non-federal lands.

Logging roads and skid roads from past timber harvests have impacted the stream network throughout the project area. Impacts from historic logging activities range from old log culvert stream crossings to skid roads constructed over stream channels. Erosion and sedimentation from these old skid roads have delivered fine sediment to the channels, undercut stream banks, or buried channels with road or skid road related debris. A few

of these old roads now carry water during winter storm events, extending the natural stream system and occasionally diverting flow from their natural stream channels. Road segments linked to the stream network increase flow routing efficiency and provide a mechanism for peak flow increases (Wemple, 1994) and increases in sediment delivery to streams. Moreover, steep hillslope road cuts may intercept subsurface flow and convert ditches into new stream segments, which in turn increases the network of streams in the watershed, runoff, and peak flows (Swanson and Wemple, 1998).

Some stream crossings and ditch relief culverts in this project area are not functioning properly due to rust, mechanical damage, being partially or fully plugged with sediment, being undersized, or other factors that increase the risk of culvert failure. A few road segments lack ditch relief culverts, increasing flow and sediment delivery to stream crossings and increasing the risk of road or culvert failure. A few roads have degraded surface aggregate resulting in excessive fine sediment being eroded from the road surface. Some roads run parallel to streams, so fine sediment is delivered to streams by way of runoff in wet winter months and dust in dry weather.

3.4.2 Environmental Effects

3.4.2.1 Alternative 1: No Action

Under this alternative, no harvest related actions, road improvement, road decommissioning, culvert replacement, additions of cross drains, or aquatic habitat restoration would occur.

Fine sediment input into streams would continue due to road related problems at failing, deteriorating, and/or non-functional stream crossing culverts. Road-stream crossings (Table B-2) would not be replaced and would continue to be a moderate to high risk of failure. Other road improvements, such as adding crushed rock and road grading, would not occur.

Direct and indirect effects to the project area watersheds under this alternative are expected to maintain current watershed conditions. The opportunities to improve water quality through road renovation and improvements and to increase forb and shrub components within accelerate overstory growth in the secondary shade zone of the Riparian Reserve would be lost or postponed.

3.4.2.2 Alternative 2

Under Alternative 2, treated Riparian Reserves would have no-harvest buffer widths ranging between 75 and 400 feet. These no-harvest buffers provide protection to unstable stream banks, headwalls, and slump prone side-slopes. The no-harvest zone also provides an opportunity for sediment created by harvest activities to filter out before reaching surface water. However, for Alternative 2 there is an increase from current conditions in permanent road of approximately 6.8 miles throughout the project area.

Table 3-5. Comparison Table of Road Renovation and Construction under Action Alternatives.

Alternative	Road Renovation (miles)	Road Renovation within RR (miles)	New Road Construction (miles)	New Road Construction within RR (miles)
Alternative 2	27.5	13.9	6.8	1.3
Alternative 3	26.8	13.3	5.5	0.9

There would likely be a pulse of sediment during the construction work of culvert installation, but with the implementation of BMPs and PDFs, the increase in the surface drainage network caused by road and ditch flow would be minimized and would be expected to result in short-term (roughly the duration of ground disturbance) negative impact. Typically, fine sediments disturbed by the equipment are flushed out by seasonal fall rains and some erosion occurs until disturbed soils on the inlets/outlets are stabilized by natural vegetation, mulch, or rip-rap. During the short-term, there would also be a likely pulse of sediment during the harvest time period due to increased road use. After harvest is completed, a total of 0.61 mile of temporary roads would be tilled to improve infiltration. A total of 2.73 miles of road are to be "winterized" after harvest, meaning they would be blocked from access, culverts would be removed, stream crossing culverts would be removed and returned to natural repose, and the roads water barred.

Approximately 27.5 miles of road would be renovated, which may include adding crushed rock, replacing failing stream crossing and cross drain culverts, and adding new cross drains to disconnect road drainage from the stream network as much as possible. Culverts placed at permanent stream crossings would be sized for 100 year flood events. This renovation work is expected to decrease the existing amount of sediment delivery occurring.

There are approximately 0.6 miles of proposed temporary road construction for Alternative 2. There are approximately 6.8 miles of proposed permanent road construction under Alternative 2. When adding any road to

the landscape, there is an increased risk of sediment delivery to the stream network and an increased risk of mass wasting, which are negative impacts to water quality and watershed function when they occur. BMPs and PDFs would be used to disconnect the road system from the stream network as much as possible, which helps to limit those increased risks. These mitigating guidelines would also ensure regular road maintenance occurs throughout the duration of project activities to reduce these risks.

One of the goals of the Willamette Basin Water Quality Restoration Plan is to decrease road densities over the landscape by decommissioning non-essential roads. Currently, there is 1.8 mile of road in the Crooked Line 24 section, which is one of the lowest road densities in an otherwise heavily roaded watershed (Table 3-3). The road density would increase to 3.0 miles in this section under Alternative 2, with 0.4 mile of new road located within the Riparian Reserve. The proposed Spur 24A would have approximately 6 cross drains installed and would require a permanent fish culvert installed approximately 82 meters above the confluence with Crooked Creek. The new crossing would be located approximately 0.9 mile (stream distance) above the confluence of Crooked Creek with Shotgun Creek. One segment of Spur 24A would parallel the stream within 75 feet of the active channel for about 250 feet. The proximity to the stream and parallel orientation presents an increased risk for sediment delivery during winter storm events or heavy winter haul. The 1.3 miles of new construction in this unit would be needed to access the 85 acres of timber. The road would climb from 1,000 feet elevation on the toe slope above Crooked Creek to 1,200 feet on the ridge. Long term soil productivity would be irreversibly lost on about 4.5 acres to access an 80 acre harvest unit (one acre for about 17 acres). The goal of decreasing road densities would not be met.

Cumulative effects of the implementation of either Alternative 2, combined with past, present, and reasonably foreseeable future actions, would be short-term increases in sediment delivery to streams due to road building and timber hauling activities associated with similar projects. The amount, location, and timing of reasonably foreseeable actions would likely include thinning harvest similar to the proposed action and potentially some regeneration harvest. However, activities causing short term sediment inputs would not happen all at one time, which would minimize the overall impact to the watershed. In the long term (10 years from beginning of project), sediment delivery is expected to be reduced and improved aquatic habitat would occur within the 5th field watersheds due to on-going and future road renovation on BLM and privately owned lands. No measurable impacts to stream flows are expected.

The checkerboard nature of land ownership in the project area, low BLM ownership, and private landowners' management strategies makes it challenging to assess the cumulative effects of BLM actions on watershed condition. More than ¾ of the lands in the project area watersheds are managed by non-federal land owners. Most of these are continually managed for timber production. Timber production on industrial timber lands must, at a minimum, meet State standards for streamside harvest, which provide for protections of stream shade, sediment inputs, and other items to enforce compliance with the Clean Water Act.

3.4.2.3 ALTERNATIVE 3

The effects of proposed actions on watershed quality under Alternative 3 would be the same as described above, excepting the following. Alternative 3 would implement helicopter harvest on portions of the project area (Table 2-5) and would construct 1.3 fewer miles of permanent rocked roads.

However, for Alternative 3, there would still be an increase in permanent road from current conditions of approximately 5.5 miles throughout the project area. It is expected that with the implementation of road BMPs and PDFs, as well as regular road maintenance occurring, that increases in the surface drainage network caused by road and ditch flow would be minimize.

Currently, there are 1.8 miles of road in the Crooked Line 24 section, which is one of the lowest road densities in an otherwise heavily roaded watershed (Table 3-3). Under Alternative 3, the road density would remain at 1.8 miles in the section and remain at a low risk. There are approximately 5.5 miles of proposed new permanent road to be constructed under Alternative 3 to implement all proposed timber sales (Table 3-4).

4.0 LIST OF IDT MEMBERS

Name	Title	Contributions
Bruce Stevens	Silviculturist	Silviculture
Cary Swain	Forester	Logging Systems
Cheshire Mayrsohn	Botanist	Botany
Chris Langdon	Wildlife Biologist	Wildlife/ACS
Chrissy Cate	Forester	Logging Systems
Dale Gough	GIS Specialist	Maps
Emily Timoshevskiy	Silviculturist	Silviculture
Greg Hedrick	Engineer	Engineering
Heather Ulrich	Archeologist	Archeology
Jessica LeRoy	Engineer	Engineering
Liz Aleman	Recreation Planner	Recreation
Lori Miller	Forester	Logging Systems
Mark Stephen	District Silviculturist	Silviculture
Panchita Paulete	Planning & Environmental Coordinator	Team Lead/NEPA
Rudy Wiedenbeck	Soils Scientist	Soils
Steve Liebhardt	Fisheries Biologist	Fisheries/ACS
Todd Bush	Hydrologist	Hydrology/Soils/ACS

5.0 REFERENCES

Amaranthus, M. P.; Page-Dumroese, D.; Harvey, A.; Cazares, E.; Bednar, L. F. 1996. Soil compaction and organic matter removal affect conifer seedling non mycorrhizal and ecto mycorrhizal root tip abundance and diversity. Res. Pap. PNW-RP-494. Portland, OR.

Eugene District Annual Program Summary and Monitoring Report – Fiscal Year 2010.

Han-Sup H.; Debbie Page-Dumroese; Sang-Kyun Han; Joanne Tirocke. 1997. Effects of slash, machine Passes, soil moisture on penetration resistance in a cut-to-length harvesting system.

McDonald, T. P.; Seixas, F. 1997. Effect of slash on forwarder soil compaction. International Journal of Forest Engineering. Vol. 8(2):15-26

National Marine Fisheries Service (NMFS). 1996. Coastal Salmon Conservation: Working Guidance for Comprehensive Salmon Restoration Initiatives on the Pacific Coast. September 1996. 5pp.

Steinfeld, D. E. 1997. Soil compaction after yarding small diameter Douglas-fir. Res. Pap. PNW-RP-504. Portland, OR: U.S. Department of Agriculture.

Swanson, F.J., Wemple, B.C., 1998. Effects of forest roads on water and sediment routing, Ecological Society of America, 1998, Annual Meeting Abstracts 23.

USDA, Soil Conservation Service (now Natural Resource Conservation Service). 1987. Soil Survey of Lane County Area, Oregon.

USDA, Soil Conservation Service (now Natural Resource Conservation Service). 1987. Soil Survey of Linn County Area, Oregon.

USDI, BLM. April 1986. Timber Production Capability Classification, Manual Supplement. Handbook 5251-1.

USDI, BLM. May 1995. Mohawk/McGowan Watershed Analysis. Eugene District Office. Eugene, OR.

USDI, BLM. June 1995. Eugene District Record of Decision and Resource Management Plan. Eugene District Office. Eugene, OR.

Wemple, B.C., 1994. Hydrologic Integration of Forest Road with Stream Networks in Two Basins, Western Cascades, Oregon. M.S. Thesis. Geosciences Department, Oregon State University.

Wemple, B. C., J. A. Jones, and G. E. Grant. 1996. Channel network extensions by logging roads in two basins, western Cascades, Oregon, *Water Resources Bulletin, 32(6)*, 1195-1207.

APPENDIX A – PROJECT DESIGN FEATURES

Project design features include design criteria, mitigation measures, and monitoring developed to provide for resource protection. PDFs are mitigations or designs to project actions developed to protect resource values and ensure conformance with regulations, laws, and policies. PDFs are presented by the primary resource discipline for which the PDF was identified as needed to protect resource values when conducting effects analyses; however, some PDFs provide benefits to multiple resources. Site-specific waiver of PDFs during implementation would be infrequent and require review by affected resources' specialists to determine that single or aggregated extent of the site-specific waiver would not produce effects outside of those analyzed. Review results would be reported to sale Authorized Officer to implement through contracts. The following PDFs are applicable to proposed actions and associated actions. Unless otherwise stated, PDFs are applicable on all units or roads.

WILDLIFE

1. Disruption to peregrine falcons would be minimized through seasonal restrictions. Project activities in McGowan Too section 17 (including road construction/decommissioning, timber falling, yarding, loading, and hauling) would be seasonally restricted from March 1 to July 15. Other project activities, such as renovation of existing roads, would not be restricted. The above restrictions may be reduced or extended in consultation with the Area wildlife biologist based on relevant survey information regarding occupation or nesting activity.
2. Disruption to spotted owls would be minimized through seasonal restrictions. Project activities in Crooked Line CL23E and North Parsons NP23A and NP23B (including road construction/decommissioning, timber falling, yarding, loading, and hauling) would be seasonally restricted from March 1 to July 15. Other project activities, such as renovation of existing roads, would not be restricted. The above restrictions may be reduced or extended in consultation with the Area wildlife biologist based on relevant survey information regarding occupation or nesting activity.
3. Under Alternative 3, noise disruption to spotted owls would be mitigated by seasonal operating restrictions on helicopter operations from landings located in T15S-R02W sections 23 and 24, and T15S-01W section 19 from March 1 to July 15.
4. Consistent with Instruction Memorandum OR-99-036 (E-4 Special Provisions), apply seasonal restrictions, or suspension of harvest and road activities within 1/4 mile of: known nesting great blue herons, peregrine falcons, bald eagles, spotted owls, great grey owls, accipiter hawks, and other owls, hawks, or raptors if they are located at any time during project activities.
5. Seasonal restrictions to operations at BLM quarries (i.e., rock/gravel collection) would be applied when quarry use would disrupt ESA or BLM special status wildlife species.
6. All Decay Class 3, 4, and 5 snags and down wood, and existing root wads would be retained undamaged when possible and/or would not be cut, except in road construction rights of way, landings, yarding corridors, and those posing a safety hazard. Where possible, cable corridors would be placed to avoid these habitat features. If such snags are felled, they would be left on site for CWD; CWD may be cut into sections and moved to facilitate operations or safety and would be counted towards any post-treatment CWD requirement.
7. Retain all wildlife trees marked with an orange-painted "W", except where necessary to accommodate safety and logging systems. Where possible, cable corridors would be placed to avoid these habitat features. If such trees are cut they would be left on site as coarse woody debris, and such CWD may be cut into sections and/or moved to facilitate operations or safety.
8. Within Riparian Reserves, any trees marked for retention but cut for safety or operational reasons would remain on site as CWD. This CWD may be cut into sections and/or moved to facilitate operations or safety.
9. Monitor snag and CWD levels at 3 years post-harvest; create snags and CWD if Desired Future Conditions are not met. Retain sufficient trees during harvest to provide for anticipated snag/CWD creation while meeting silvicultural requirements (canopy closure, RD, TPA, etc.).

AQUATICS

10. Roadside logging along Road No.15-2-24.1 in Middle Ridge would not be permitted from MP 0.00 to MP 0.11.
11. Right-of-way stumps shall be grubbed out only within the road prism (road surface, ditch line, and cut/fill areas) and not within other portions of the posted right-of-way unless necessary to facilitate intended function of the road (i.e., turnarounds, curve widening).
12. To protect fish species during critical life cycle functions, apply the Oregon Department Fish and Wildlife (ODFW) in-water guidelines for all stream culvert placement and removal.
13. Require the following along streams:
    a. Stream flow would be routed around the construction activity as much as possible (i.e., temporary flow diversion structure).

   b. A sediment containment structure would be placed across the channel below the work section (i.e., weed free mulch) as needed.
   c. Work site would be pumped free of standing water as applicable.
   d. If present, fish and other aquatic species would be removed from the project area and block nets placed above and below the worksite by Area fisheries biologist.
   e. After installation, disturbed ground would be planted with appropriate BLM-provided seed or straw/wood mulch before the first rains.
   f. Countersink culverts in fish bearing streams at least 6-8 inches below the streambed to minimize scouring.
14. Non-functional cross drains would be rendered functional and cross drains to be added would be installed prior to log haul beginning.
15. Implement the following combination of methods year round to maintain drainage and minimize sedimentation from roads into stream channels:
   a. Keep ditch line, cross drains, and leadoff ditches clean and free to flow, while minimizing disturbance to existing ditch line vegetation.
   b. Sediment traps, rock armor, or other devices may be installed in ditch lines lacking vegetation and having the potential to deliver sediment to streams.
   c. Prior to and during haul operation, rock surfacing and road maintenance would be assessed for road damage, drainage, and erosion throughout the project and haul route to determine if haul may continue or if any damage has occurred that would require corrective actions (e.g., grading, crowning, adding rock) before haul may resume.
   d. If erosion and road degradation occurs during or after freeze and thaw or rainy periods, log haul operations may be discontinued.
16. When removing stream crossing structures, apply the following measures:
   a. Remove all fill material down to original channel bottom.
   b. Dig the channel to its bank-full width with a natural gradient.
   c. Shape and pullback channel side-slopes to gradual enough angle (i.e., 1.5:1) to facilitate seeding and mulching.
   d. Erosion control would be completed prior to fall rains using appropriate seed/straw mulch applied by BLM.
   e. Position fill or waste material in a location that would avoid sediment discharges to streams or wetlands.
17. Construction of roads would not occur when soils are saturated, in order to minimize soil displacement, erosion and sedimentation. Blading and rocking would occur as needed.
18. Areas of exposed soil associated with road construction (typically along cut and fill slopes) would be seeded with BLM-provided native seed and/or mulch up to the closest cross drain or 200' from the stream crossing, whichever is closer.
19. Removal, notification, transport and disposal of any diesel, hydraulic fluid, or other petroleum product released into soil and/or water would be accomplished in accordance with all applicable laws and regulations.
20. Keep a Spill Contamination Kit (SCK) on-site during any operation within the project area; prior to starting work each day, all machinery would be checked for leaks and necessary repairs would be made.
21. Slash, logging debris, and stacked logs to be sorted would be removed from road ditches during the wet season if impeding drainage function to allow for proper road drainage.
22. If streams must be crossed, keep corridors as perpendicular to stream as possible to limit canopy loss. Full suspension is required.
23. Use of native surface roads would only occur during dry season (typically July 1 through October 1).
24. Avoid placing new skid trails within 75 feet from stream or wetland no cut boundaries. Apply directional felling of trees to lead of the skid trails and maximize winching distance within Riparian Reserves. Use existing skid trails where appropriate (as determined by AO).
25. New landings would be located a minimum of 75' from posted stream and wetland no-cut boundaries.
26. Under Alternative 3, helicopter-log landing requires a cleared area sloped to no less than 2% to provide for adequate drainage and not in excess of 6%. The area should be cleared to approximately 80’ x 225’-250’.
27. New landings under Alternative 3 used for storage of helicopter fuels (service landings) would be located a minimum of 150 feet from streams and wetlands. Fuel tanks located on the service landing must have dikes around them to contain any fuel spill. Use of sediment traps or check dams would also be required if sediment runoff into streams or wetlands is occurring.
28. Waterbars, drain dips, and/or lead-off ditches may be required to create an erosion resistant condition on roads during seasonal closures. Access to such roads shall be blocked during closures.
29. Position waste from road construction, renovation, and decommissioning a minimum of 50 feet from stream or wetland.

RECREATION

30. An on-site recreation resource advisor would be consulted and present as needed during all trail restoration activities.
31. Original trail locations would be retained as the preferred basis for post-harvest trail reconstruction efforts. No alternative trail location(s) would be selected without prior consultation with BLM recreation personnel.
32. Reconstructed trail parameters would be physically defined using readily available slash, logs, and brush in instances where road and/or logging corridors intersect trails and trail routes are no longer easily defined. This would occur to prevent and discourage OHV activity off the trail right-of-way.
33. Reconstructed trail segments would be constructed to designed use widths using appropriate mechanical and/or manual tools that allow for restoration of trail characteristics.
34. A minimum of 2 weeks notification of entry by the purchaser to BLM recreation personnel would be required to allow for posting of closed trails prior to harvest activities beginning.
35. For trails that access the developed OHV parks, closure of trails would occur at point of origin at either Cascade View OHV Complex or the Crooked Creek OHV Staging Area, and/or at point of origin of the trail with connecting trails or roads.
36. On-site signing and placement of physical barriers at involved trail entry points would be utilized.
37. The general public would be reasonably notified of all affected roads with increased operational traffic due to project activities. Notification efforts would be varied and tailored to meet area visitation and operational needs.
38. Minimize duration of impacts to recreational resources and users in Middle Ridge and portions of North Parsons 23/26 by limiting contracted harvest periods to 18 months.
39. Require purchaser to “close” (i.e., complete all clean-up activities, remove all equipment and timber, and complete trail restorations) as stipulated in the timber sale contract for each section upon the completion of stands’ harvest in Drury Combo 17 and Crooked Line 10, 15, and 23.

SILVICULTURE

40. Typically trees greater than 24”, minor coniferous species (i.e., species other than Douglas-fir and western hemlock), hardwoods, and yew trees would be reserved, except where necessary to accommodate safety and logging systems and to meet BA targets.
41. Where operationally feasible, falling techniques would be utilized for the protection of retention trees and other reserve areas such as falling to lead.
42. Harvest activities during sap flow season should be minimized and monitored to ensure unacceptable residual stand damage is not occurring. Additional protections to trees (e.g., plastic barreling) during sap flow would be required if damage to tree cambium is occurring.
43. Limit log lengths to 40' in length where necessary to minimize damage to residual trees, snags and coarse woody debris during yarding.

SOILS

44. Compacted surface of native surface spur roads, landings, and other compacted areas such as turnouts, truck turnarounds, and log decking areas shall be subsoiled (broken up, loosened, decompacted) with excavator attachments, log loader tongs or other effective equipment:
    a. All decompaction equipment shall be inspected and approved by AO in consult with the soil scientist before tillage begins.
    b. Subsoiling shall be completed to a minimum depth of 18" below the ground surface and span the entire width of compacted surface.
    c. At least 80% of compacted soil profile shall be shattered, except within a five foot radius of the boles of residual trees where major roots can be cut or mangled or in areas where equipment is prohibited from operations (i.e., on slopes in excess of 35% or crossing streams).
    d. Subsoiling shall occur during the same summer season as harvest operations or completion of native surface road use and stabilized prior to fall rains (typically Oct. 1). Should fall rains come early and subsoiling does not get completed, all native surface roads would be put in an erosion resistant condition and blocked before Oct. 1 until such time as subsoiling could occur. This includes construction of waterbars, drainage dips, and barriers (root wads, large woody debris or brush piles). Waterbar spacing to be based on gradient and erosion class.
45. Except during winching (ground based) or skyline lateral yarding, skidding and yarding systems must at least keep the leading ends of all logs suspended above the ground during inhaul cycle. Use of intermediate supports would be used to ensure suspension.
46. During cable harvest activities:

a. Cable corridor width limited to 12 feet maximum;
b. Independent cable settings and single cable corridors to be spaced 150 feet apart on average;
c. Waterbars or woody material would be applied in corridors with severe compaction to limit the potential for prolonged accelerated erosion;
d. Lateral yarding limited to 75 feet; and
e. Yard only to approved landings, with landing size average being 60' x 40' and not generally exceeding 60' x 80'.

47. Design ground based units with skid trail pattern on up to 35% favorable skidding to downhill GB landings, and a skid trail pattern with up to 20% adverse skidding to uphill ground based landings.
48. Skid Trails would not be designated on identified skeletal or shallow soils. Decompact/subsoil all severely compacted skid trails w/ excavator or other properly designed equipment. This could be waived if inspection reveals that less than 2% of the GB unit is severely compacted.
49. Ground base equipment operations may be suspended during periods of prolonged rain.
50. To minimize soil compaction, limit ground based skidding and yarding to the annual dry season (typically July 1 to Oct. 1) when soils provide the most resistance to compaction.
51. BLM shall not approve skid trails through identified areas of high water tables or where skid trails would channel water into unstable headwall areas.
52. Design drainage for all temporary native surface roads with lead off ditches, temporary culverts, drainage dips, or outsloping. Maintain drainage function as needed during use.
53. Mechanized harvest systems would only be approved for travel when all of the following are met:
    a. A unit has been analyzed for GB systems;
    b. On slopes less than 35%;
    c. Restrict operations to dry conditions with less than 25% soil moisture content;
    d. Confined to operating from a prepared slash mat that the machine creates of sufficient depth which results in no severe compaction; and
    e. Limit equipment movement to one pass over the same ground off of designated skid trails.
54. Trails would be approved by the BLM prior to approval for timber felling. Ground base skidding area shall keep a skid trail pattern to keep within 10% of the ground base unit by restricting operations to 12' wide trails spaced at least 150' apart. GB skidding/yarding equipment to remain on designated skid trails at all times.
55. Scatter limbs, slash, and logs greater than 6 inch diameter over the subsoiled surface with an excavator equipped w/ a thumb or clamp. Debris to cover at least 50% of treated road length where quantity of this material is available. Scatter landing piles, along temporary roads, on top of the road surface to remove the fuel concentrations, deter OHV use and slow erosion.
56. TPCC withdrawals are subject to full suspension; excepting TPCCs in North Parsons 33D where tree heights for full suspension are limited and full suspension is recommended if achievable. Select TPCCs (MR1) would permit corridors within 50 feet of TPCC boundaries where required for operations. Full suspension would still be required where possible.

FUELS

57. Cover and burn all landing piles along roads.
58. Pile, cover and burn slash, less than 6" in diameter and greater than 3' in length, within 25 feet of either side of designated (typically permanent) roads within harvest areas.
59. Resulting fuel bed along roads where scattering of limbs and slash has occurred would not be deep and continuous. Piles along temporary roads not scattered on the road surface would be covered and burned.
60. Cover all piles to be burned with plastic in compliance with the Oregon Smoke Management Plan.

OTHER

61. Prior to use, areas used for borrow and fill need to be reviewed for Special status plants by area Botanist.
62. Where a decommissioned road connects to an active road, sow with native seed first 200' of the tilled, decompacted road.
63. Gravel, fill, and borrow material would be weed free. Gravel from pits known to be weedy should not be used.
64. All logging, tilling and road construction equipment must be washed and be free of dirt and plant debris prior to arrival on BLM lands. When moving equipment from the Mohawk/Marcola area, it needs to be washed before moving onto BLM lands outside the Mohawk/Marcola area.
65. Early detection rapid response species along roads or in units would be treated prior to harvesting unit. Roadside mowing to limit the spread of weeds would occur as scheduled.
66. Cultural resource surveys have been completed prior to harvest. If additional sites are found within the project area appropriate actions would be taken to mitigate effects to the sites.

APPENDIX B – TABLES

Table B-1: Road Construction.

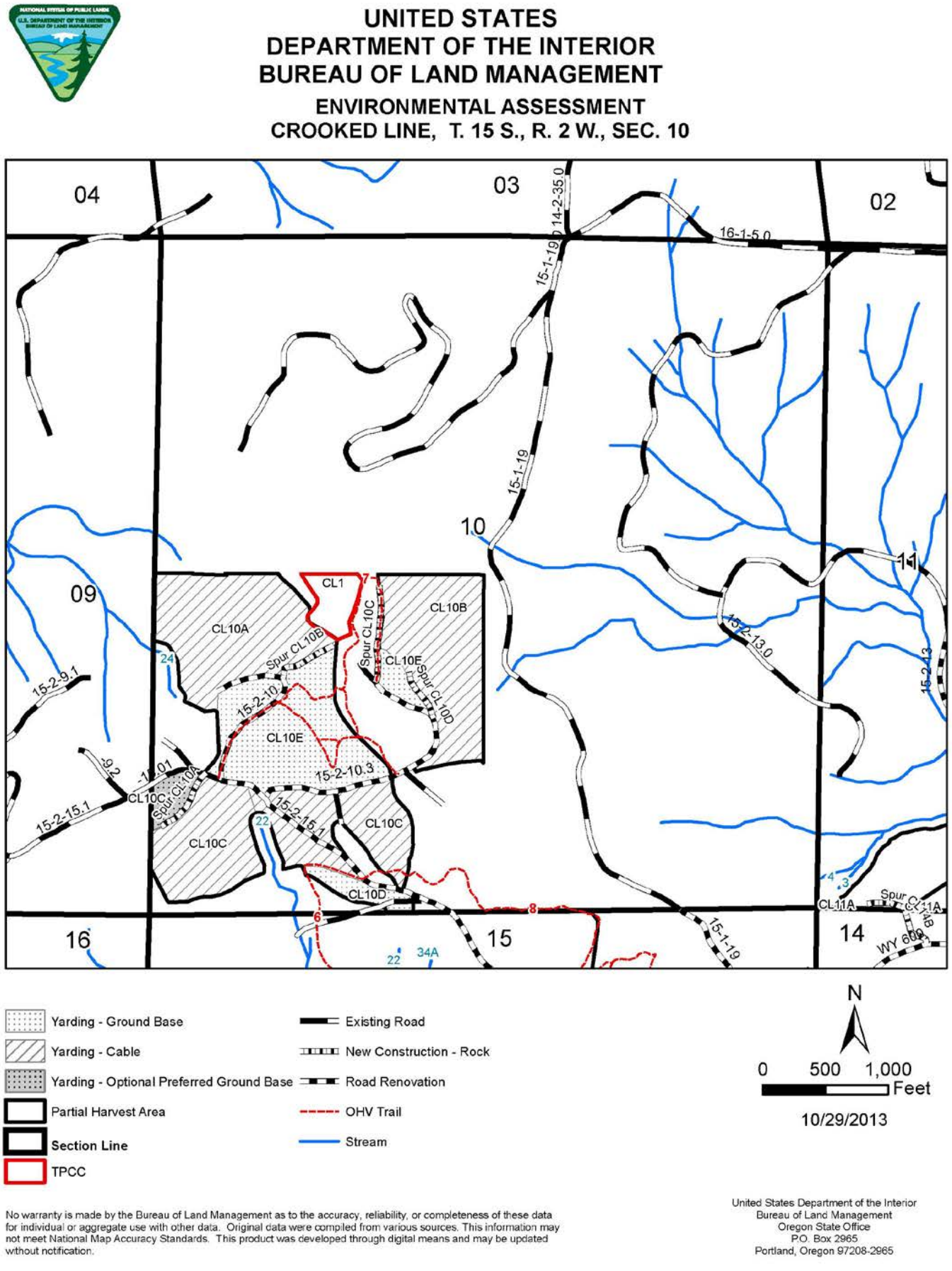
Spur #	Length (mi)	Temp./Perm.	Proposed Surface Type	Post-Sale Decom.	Comments
CL10A	0.11	Permanent	Rock	None	
CL10B	0.10	Permanent	Rock	Block only	
CL10C	0.15	Permanent	Rock	None	Possibly designate use back to trail or re-route trail adjacent, install 1 x-drain
CL10D	0.08	Permanent	Rock	None	
CL14A	0.20	Permanent	Rock	None	Install 2 x-drains
CL14A1	0.025	Permanent	Rock	None	
CL14B	0.13	Permanent	Rock	Block only	Install 1 x-drain
CL14C	0.07	Permanent	Rock	Block only	
CL15A	0.20	Permanent	Rock	Block only	Install 1 x-drain
CL24A	0.98	Permanent	Rock	None	Install 6 x-drains & 1 stream x-ing (fish)
CL24A1	0.29	Permanent	Rock	None	Install 2 x-drains
CL15A	0.21	Permanent	Rock	None	
CL15B	0.17	Permanent	Rock	None	
CL14A1	0.02	Permanent	Rock	None	
DC12A	0.15	Permanent	Rock	None	
DC13A	0.12	Temporary	Native	Block & Till	
DC13B	0.12	Perm/Temp	Rock/Native	Block & Till	If rocked, stays permanent
DC15A1	0.06	Temporary	Native	Waterbar & Till	
DC15A2	0.11	Temporary	Native	Waterbar & Till	
DC15A3	0.10	Temporary	Native	Waterbar & Till	
DC17A	0.30	Permanent	Rock	None	Install 2 x-drains
DC17B	0.06	Permanent	Rock	None	
DC17C	0.13	Permanent	Rock	None	Install 1 x-drain
DC8E	0.22	Permanent	Rock	None	Install 2 x-drains
DC8E1	0.05	Permanent	Rock	None	
MR13B	0.35	Permanent	Rock	Block only	Install 2-4 x-drains; block at OHV trail intersects only
MR13B1	0.02	Permanent	Rock	None	
MR13C1	0.10	Temporary	Native	Block & Till	
MR13E	0.05	Permanent	Rock	None	
MR13F	0.03	Permanent	Rock	None	
MT8B1	0.03	Permanent	Rock	None	
MT8B	0.36	Permanent	Rock	None	Install 2-3 x-drains
MT8A	0.27	Permanent	Rock	None	Install 1-2 x-drains
MT33C	0.05	Permanent	Rock	None	
MT33B1	0.12	Permanent	Rock	None	
MT33B	0.31	Permanent	Rock	None	Install 3-4 x-drains
MT33A	0.27	Permanent	Rock	None	Install 2 x-drains
MT17A1	0.07	Permanent	Rock	None	
MT17A	0.23	Permanent	Rock	None	
NP26A	0.35	Permanent	Rock	Block only	Install 2-4 x-drains; block at OHV trail intersects only
NP26A1	0.02	Permanent	Rock	None	
NP26B	0.16	Permanent	Rock	Block only	Install 2-3 x-drains; block at OHV trail intersects only
NP26C	0.25	Permanent	Rock	None	Install 1-2 x-drains
NP28A	0.16	Permanent	Rock	None	Install 1-2 x-drains
Total mi	**7.34**				

Table B-2: Road Renovation and Improvements.

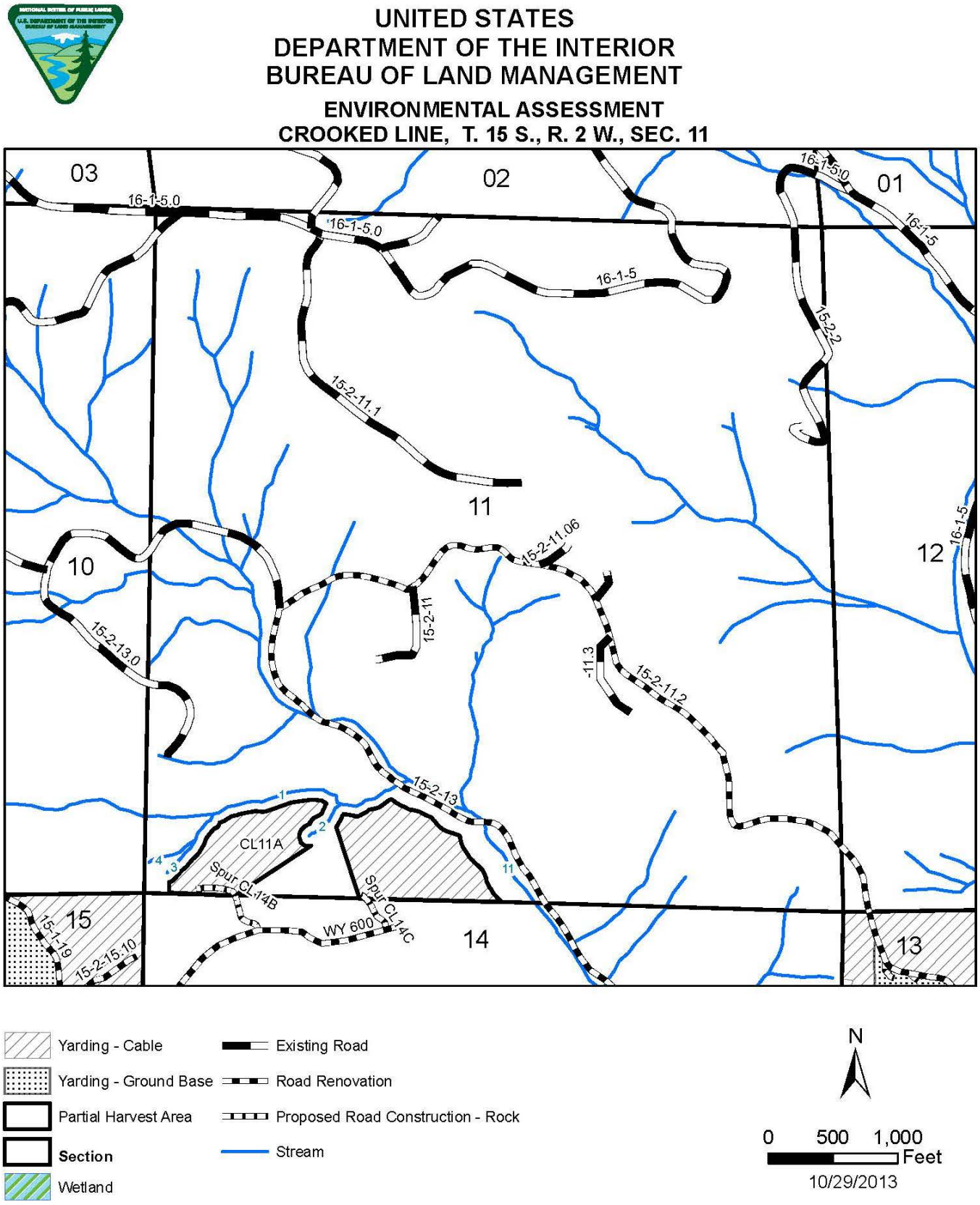
Road #	Length (mi)	Proposed Surface Type	Post-Sale Decom.	Comments
15-1-8/WY 10 rd	1.41	Rock	None	
15-1-13	1.41	Rock	None	
15-1-15.2	1.09	Rock	None	
15-1-15.2 ext	0.82	Native	waterbar	2 temporary pipes to be installed @ fish x-ing, rock 100' either side of channel
15-1-17.2	1.28	Rock	None	5 x-drains & 1 stream x-ing planned for replacement/installation
15-1-19.1	0.21	Rock	None	
15-1-20.1	0.49	Rock	None	3 x-drains & 1 stream x-ing planned for replacement/installation
15-1-31	0.75	Rock	None	1-4 x-drains planned for replacement/installation
15-2-10	0.30	Rock	None	1 x-drain planned for replacement/installation
15-2-10.3	0.43	Rock	None	
15-2-11	0.21	Rock	None	
15-2-11.2	1.56	Rock	None	1-4 x-drains planned for replacement/installation
15-2-13	1.78	Rock	None	
15-2-13.2	0.16	Rock	None	
15-2-13.6	0.27	Rock	None	
15-2-15	1.07	Rock	None	
15-2-15.1	0.79	Rock	None	
15-2-15.10	0.22	Rock	None	
15-2-15.2	0.63	Rock	None	
15-2-15.4	0.12	Rock	None	
15-2-15.5	0.16	Rock	None	
15-2-23	0.36	Rock	None	
15-2-23	0.22	Rock	None	
15-2-23.1	0.12	Rock	None	
15-2-23.4	0.39	Rock	None	
15-2-23.5	0.28	Rock	None	
15-2-24.1	0.96	Rock	None	1-3 x-drains & 1 stream x-ing planned for replacement/installation
15-2-25	0.25	Rock	None	2-6 x-drains & 1 stream x-ing planned for installation
15-2-28.1	0.83	Rock	None	1 x-drain & 1 stream x-ing planned for replacement/installation
15-2-28.2 A	0.52	Rock	Block & waterbar	2-4 temporary x-drains to be installed
15-2-28.2 C	0.73	Rock	None	
15-2-28.3	0.55	Rock	None	
15-2-28.4	0.25	Rock	Block & waterbar	1-2 temporary x-drains to be installed
15-2-29.4	0.53	Rock	Block & waterbar	2-4 temporary x-drains to be installed
15-2-29.4 ext A	0.06	Rock	None	
15-2-29.4 ext B	0.08	Rock	None	
16-2-17.1	0.80	Rock	None	2 culverts planned for replacement/installation
16-2-17	0.45	Rock	None	
16-2-18.1	1.16	Rock	None	1 culvert planned for replacement/installation
16-2-28	1.21	Rock	None	3 culverts planned for replacement/installation
16-2-33.3	0.20	Rock	None	
16-2-33.2	0.14	Rock	None	

Road #	Length (mi)	Proposed Surface Type	Post-Sale Decom.	Comments
16-2-33.1	0.68	Rock	None	
Spur DC22A	0.25	Native	Block and till	
Spur CL15C	0.10	Rock	None	
Spur CL15C1	0.025	Rock	None	
Spur MT33D	0.09	Native	Block & waterbar	
Spur MT17B	0.08	Native	Block only	Install 1 stream x-ing
Spur NP28B	0.11	Rock	waterbar	
Spur NP28C	0.14	Rock	waterbar	
WY 600	0.72	Rock	None	
Total mi	**27.58**			

Map 1. Crooked Line 10 – Alternatives 2 & 3.



Map 2. Crooked Line 11 – Alternatives 2 & 3



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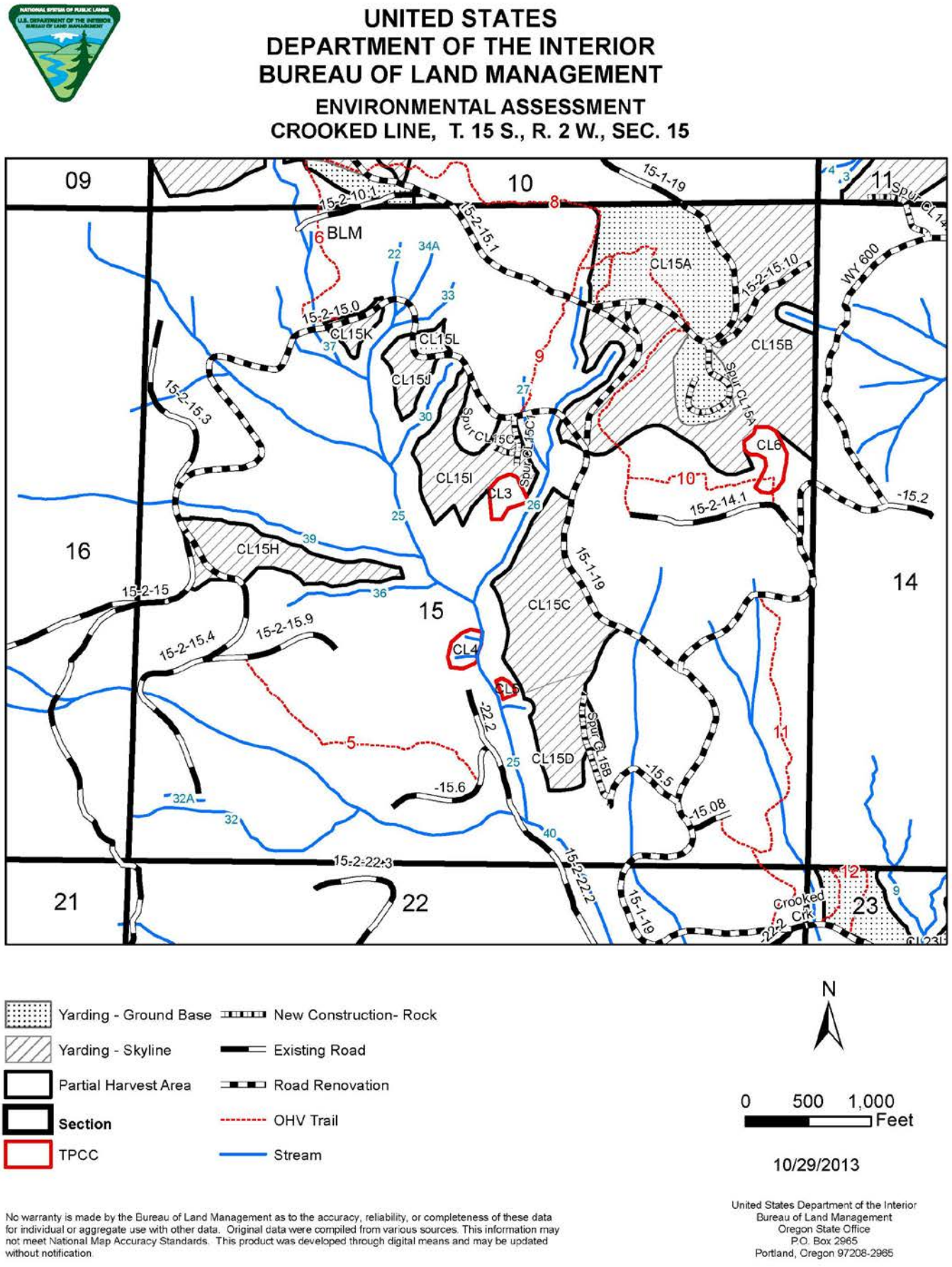
Map 3. Crooked Line 15 – Alternatives 2 & 3



Map 4. Crooked Line 23 – Alternatives 2 & 3

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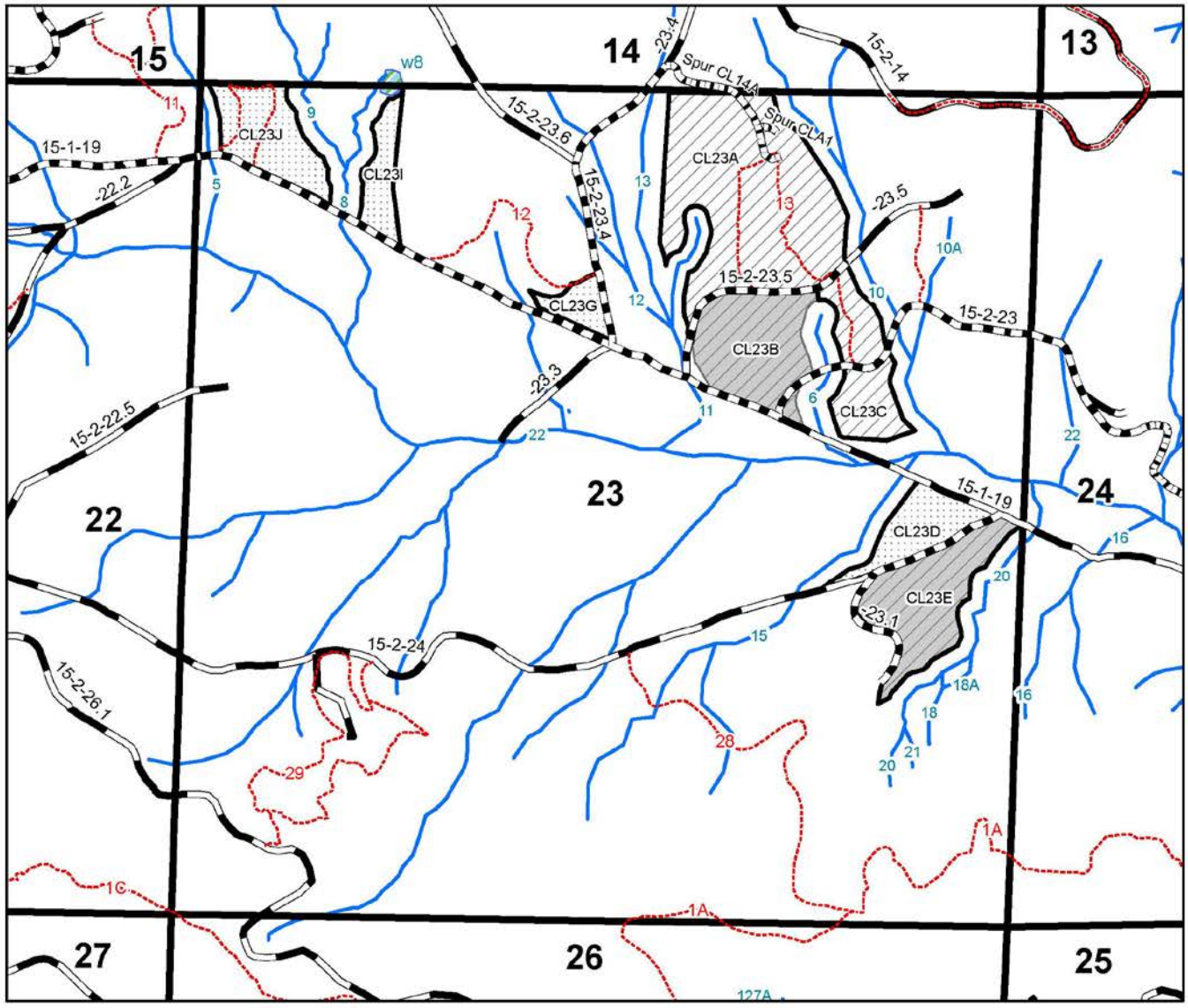
ENVIRONMENTAL ASSESSMENT
CROOKED LINE, T. 15 S., R. 2 W., SEC. 23



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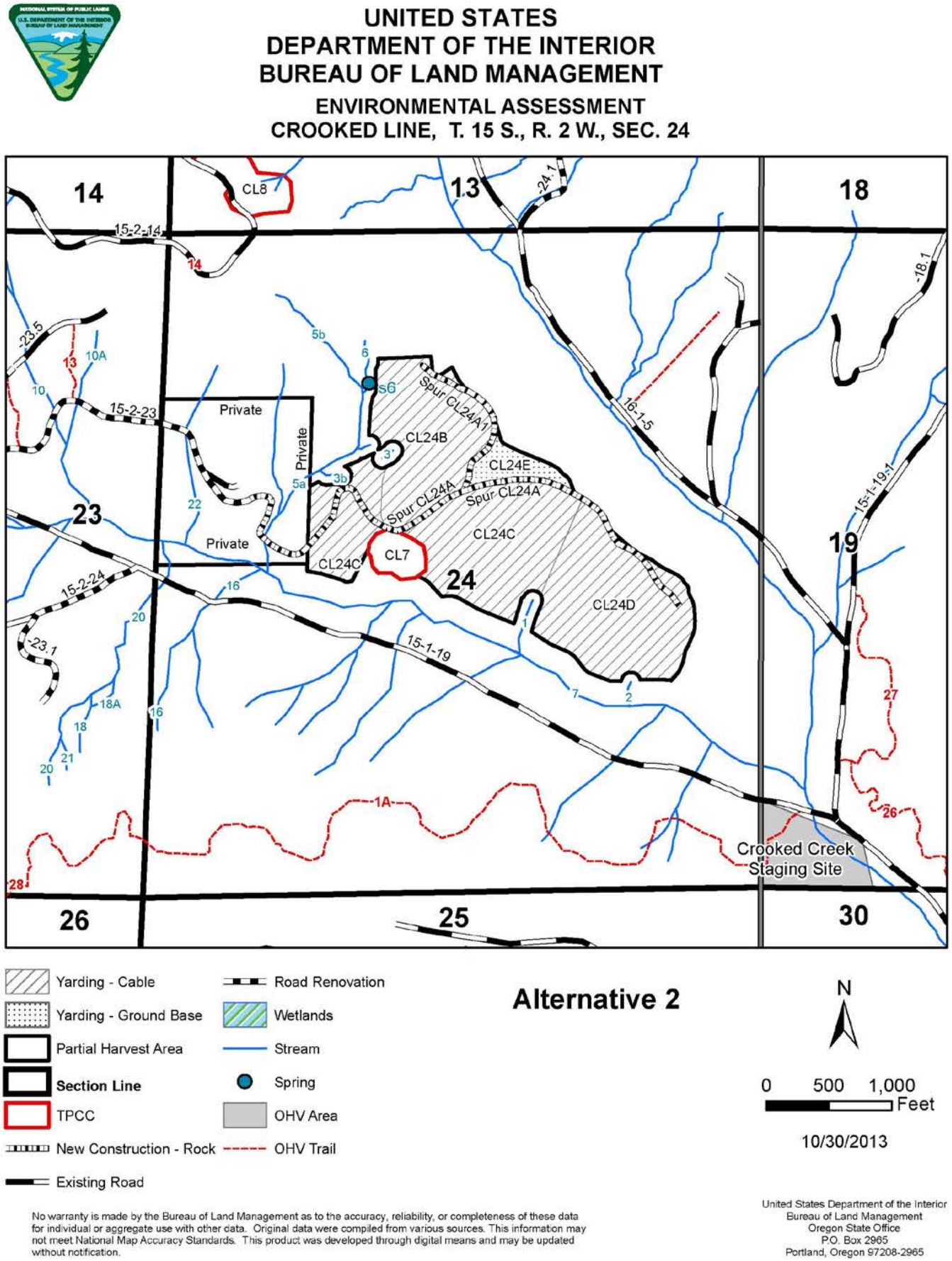
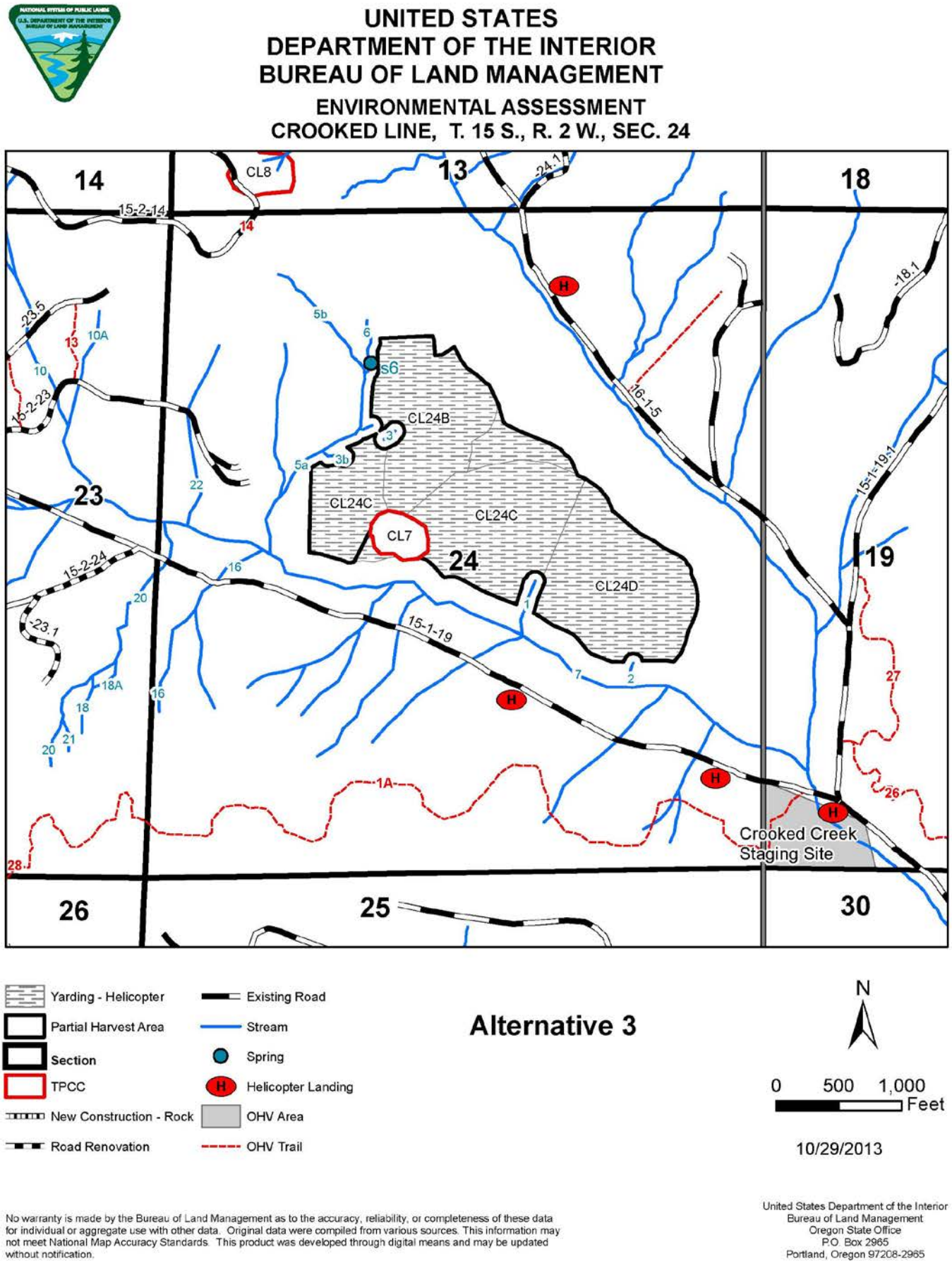
Map 5. Crooked Line 24 – Alternative 2



Map 6. Crooked Line 24 – Alternative 3



Map 7. Drury Combo 13 – Alternatives 2 & 3

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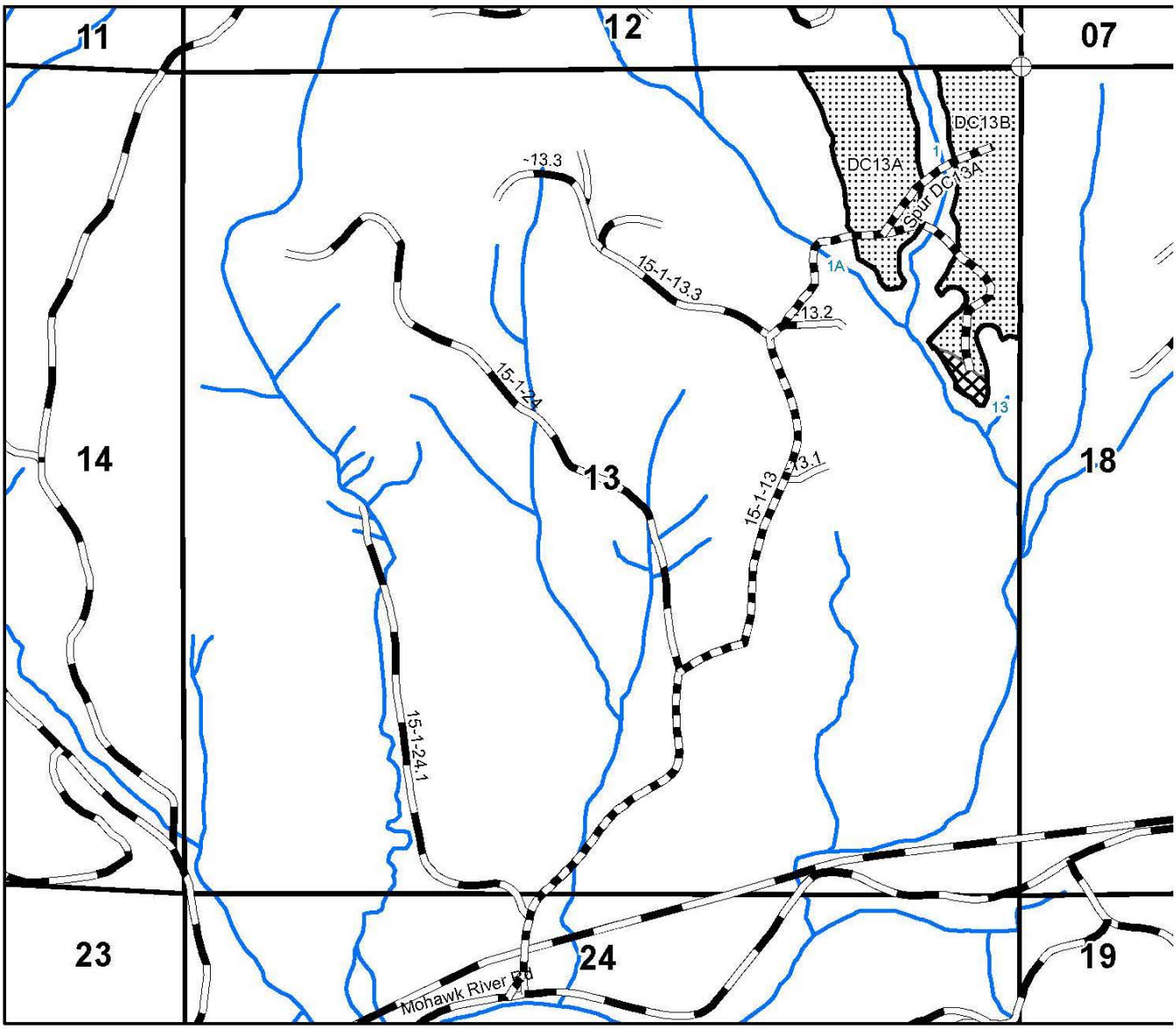
ENVIRONMENTAL ASSESSMENT
DRURY COMBO, T. 15 S., R. 1 W., SEC. 13



Yarding - Ground Base
Yarding - Special Yarding Area
Partial Harvest Area
Section
Existing Road
Road Renovation
Stream

N

0 500 1,000 Feet

10/29/2013

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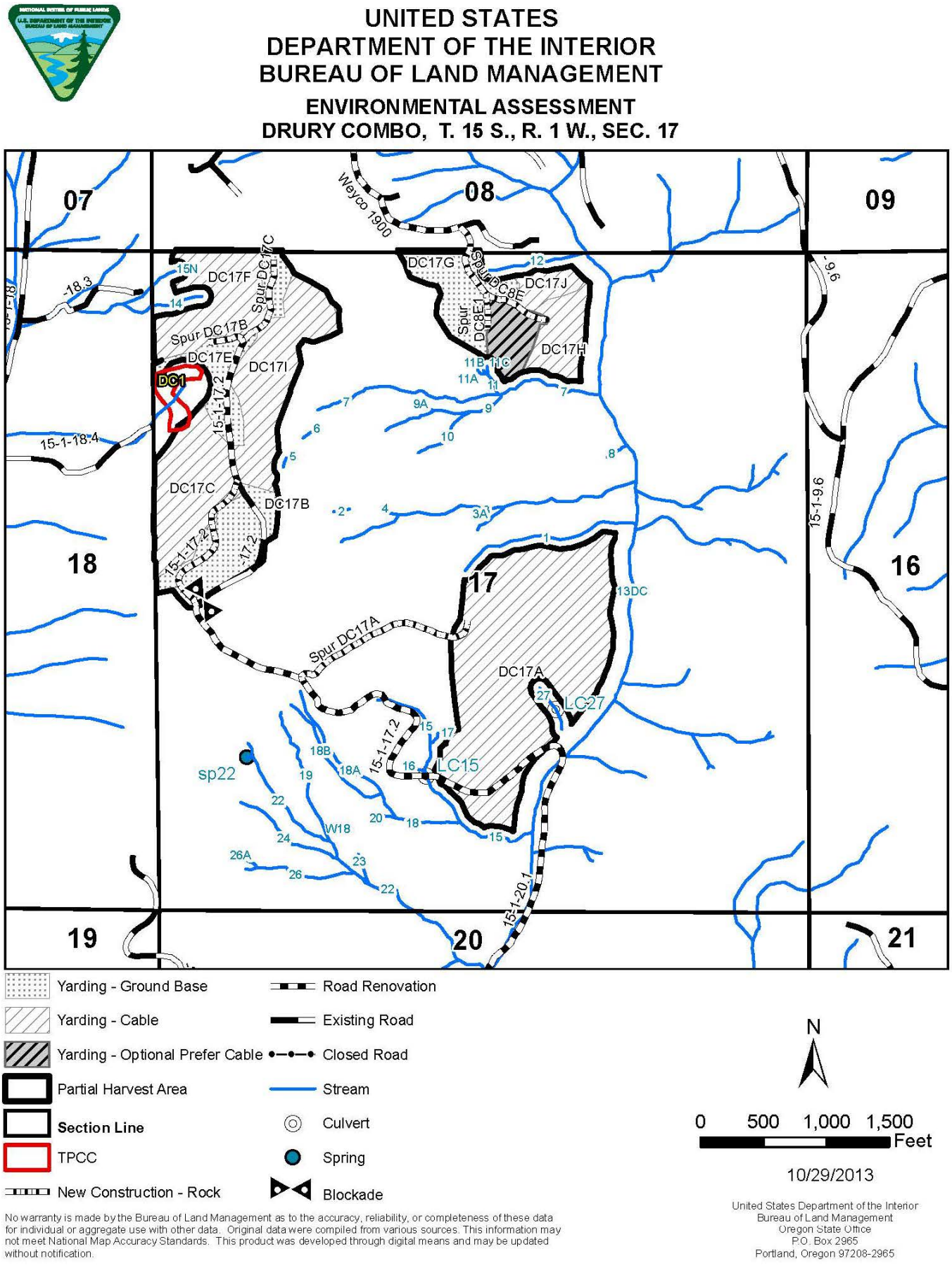
Map 8. Drury Combo 17 – Alternatives 2 & 3



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Map 9. Drury Combo 22/27 – Alternatives 2 & 3

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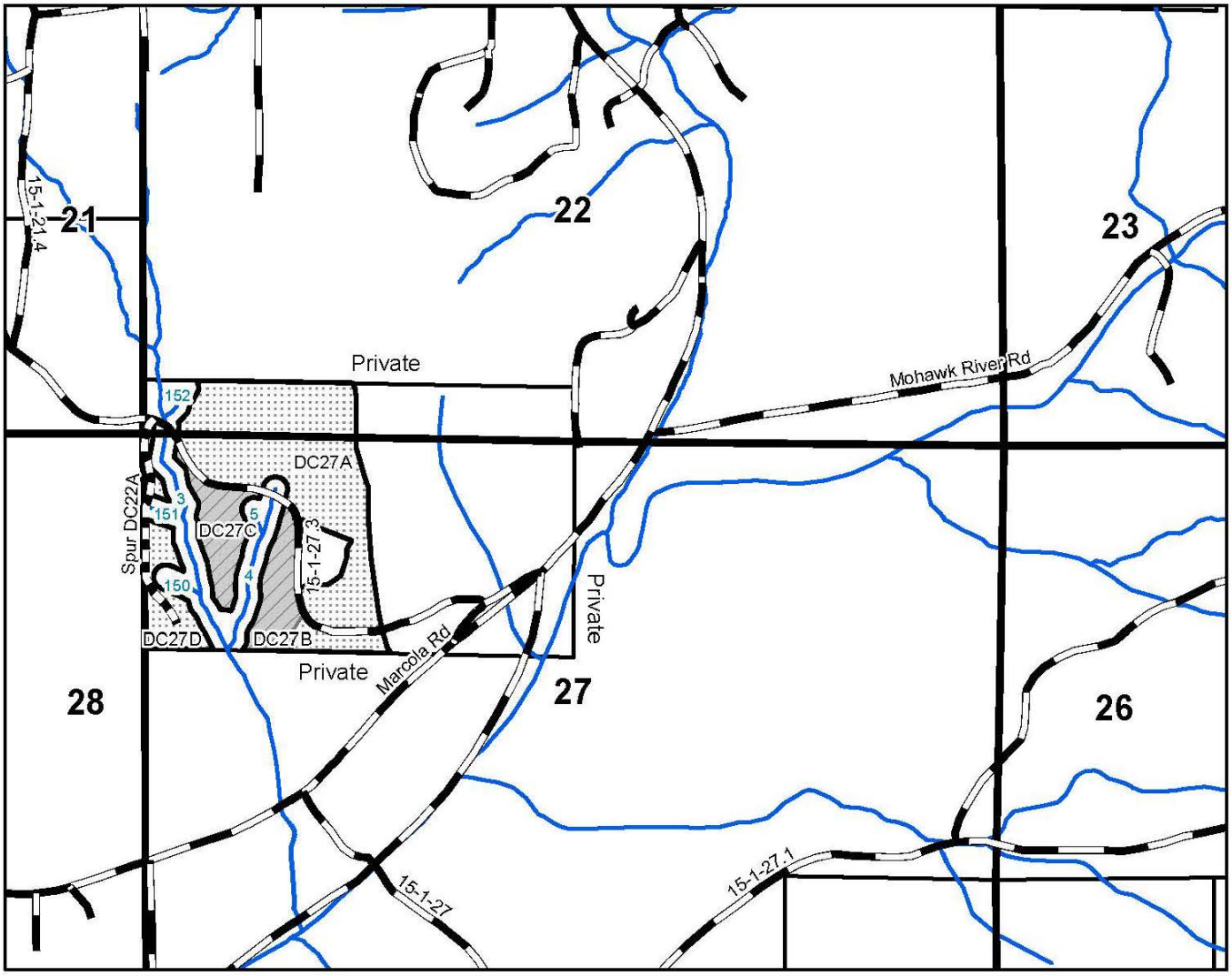
DRURY COMBO, T. 15 S., R. 1 W., SEC. 22 and 27



Yarding - Optional Prefer Cable

Yarding - Ground Base

Partial Harvest Area

Section Line

Stream

Existing Road

Road Renovation

N

0 500 1,000 1,500 Feet

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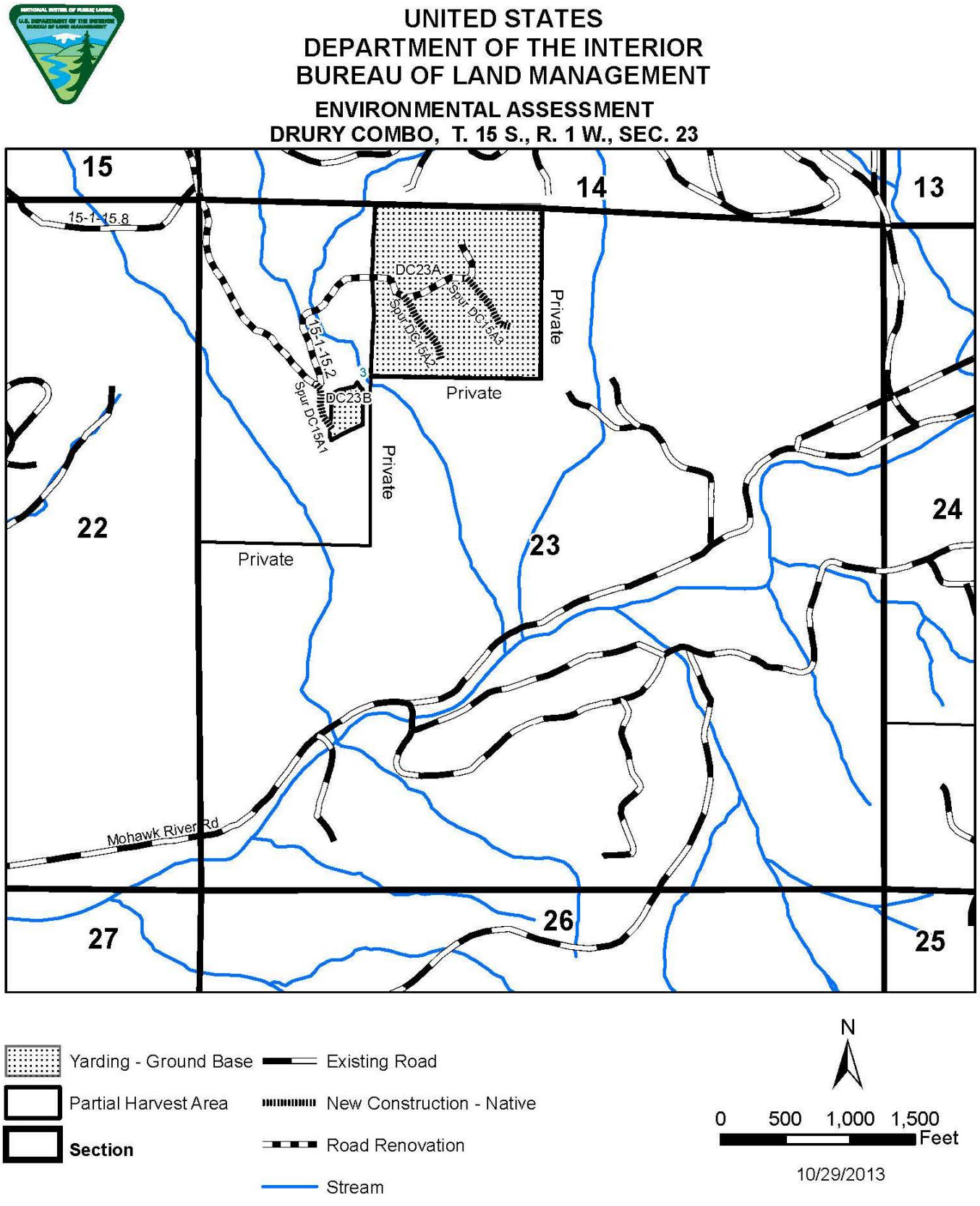
Map 10. Drury Combo 23 – Alternatives 2 & 3



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Map 11. McGowan Too 17 – Alternatives 2 & 3.

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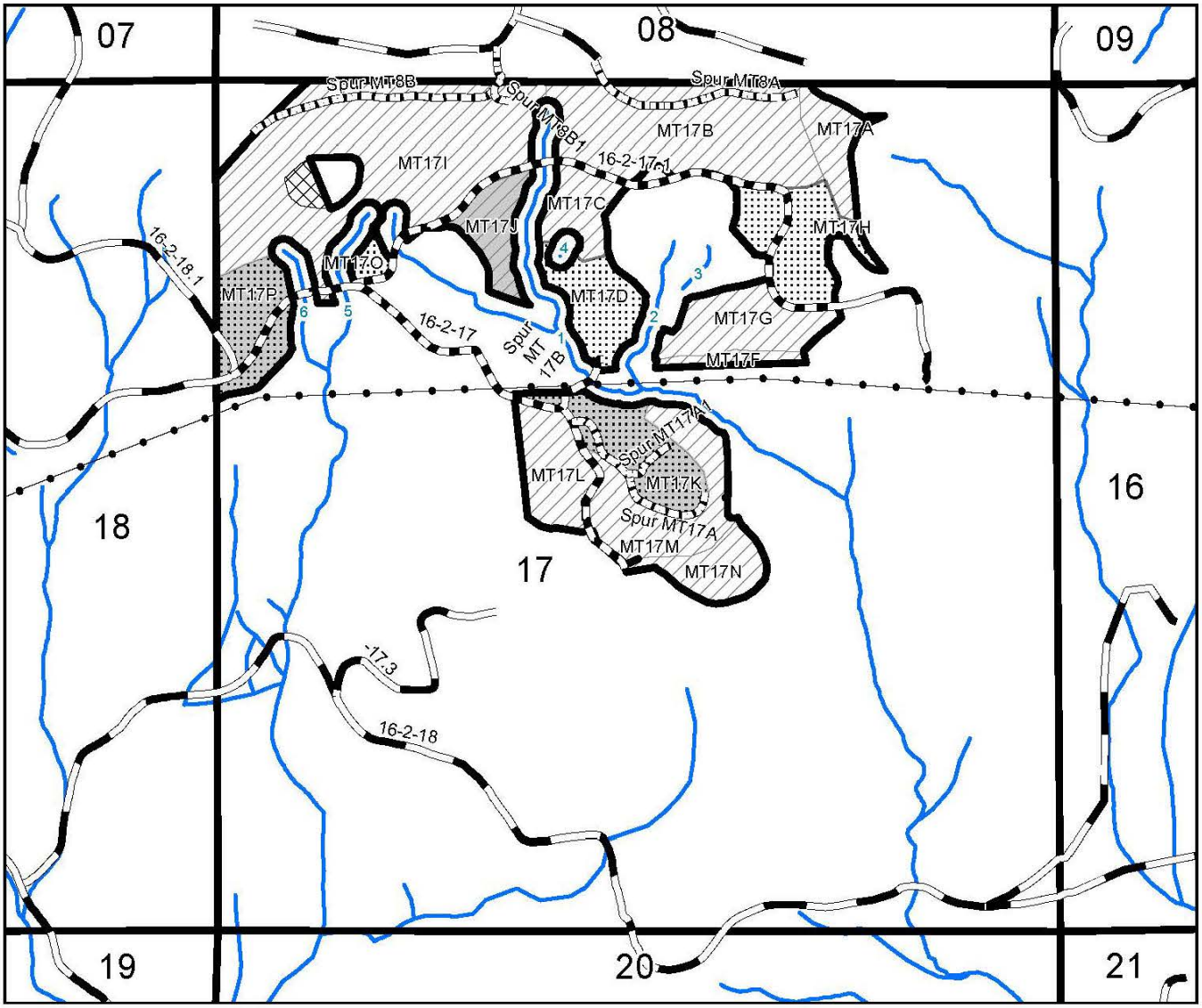
ENVIRONMENTAL ASSESSMENT
MCGOWAN TOO, T. 16 S., R. 2 W., SEC. 17



Yarding - Special Yarding Area
Yarding - Ground Base
Yarding - Optional Preferred Ground Base
Yarding - Cable
Yarding - Optional Preferred Cable
Partial Harvest Area
Section Line

Power Line
Existing Road
Road Construction - Rock
Road Renovation
Stream

N

0 500 1,000 1,500 Feet

11/4/2013

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Map 12. McGowan Too 33 – Alternatives 2 & 3

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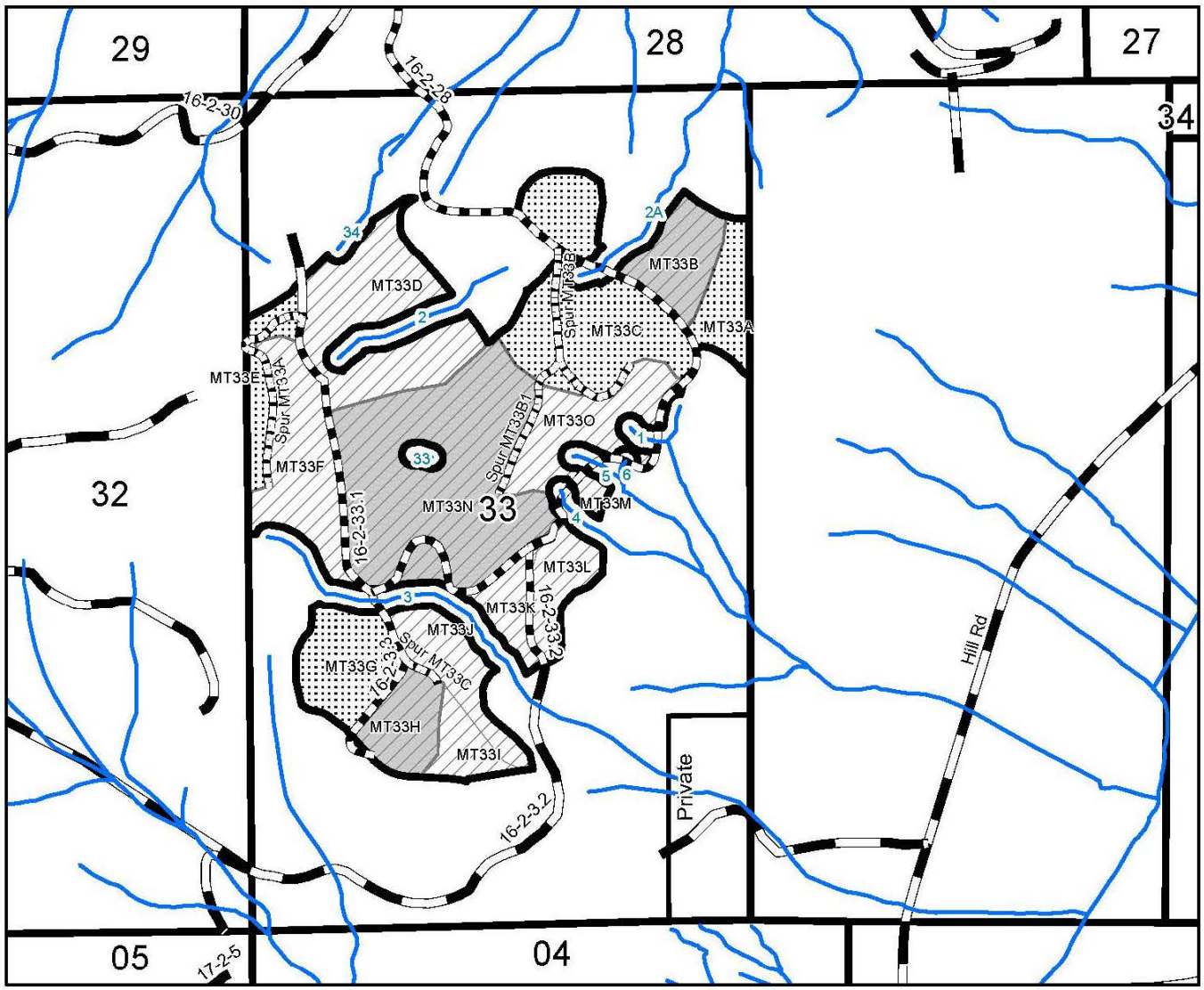
MCGOWAN TOO, T. 16 S., R. 2 W., SEC. 33



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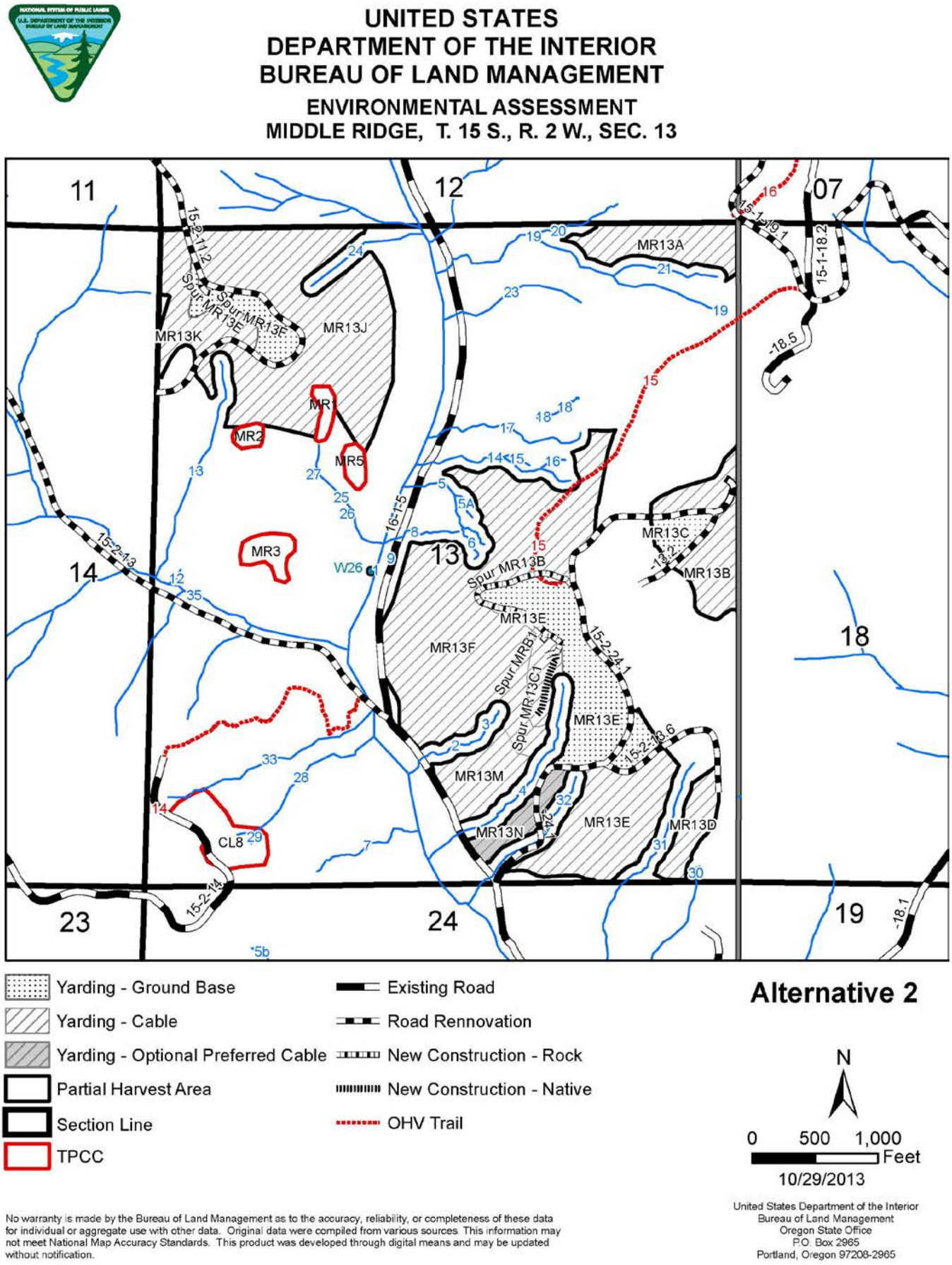
Map 13. Middle Ridge 13 – Alternative 2



Map 14. Middle Ridge 13 – Alternative 3

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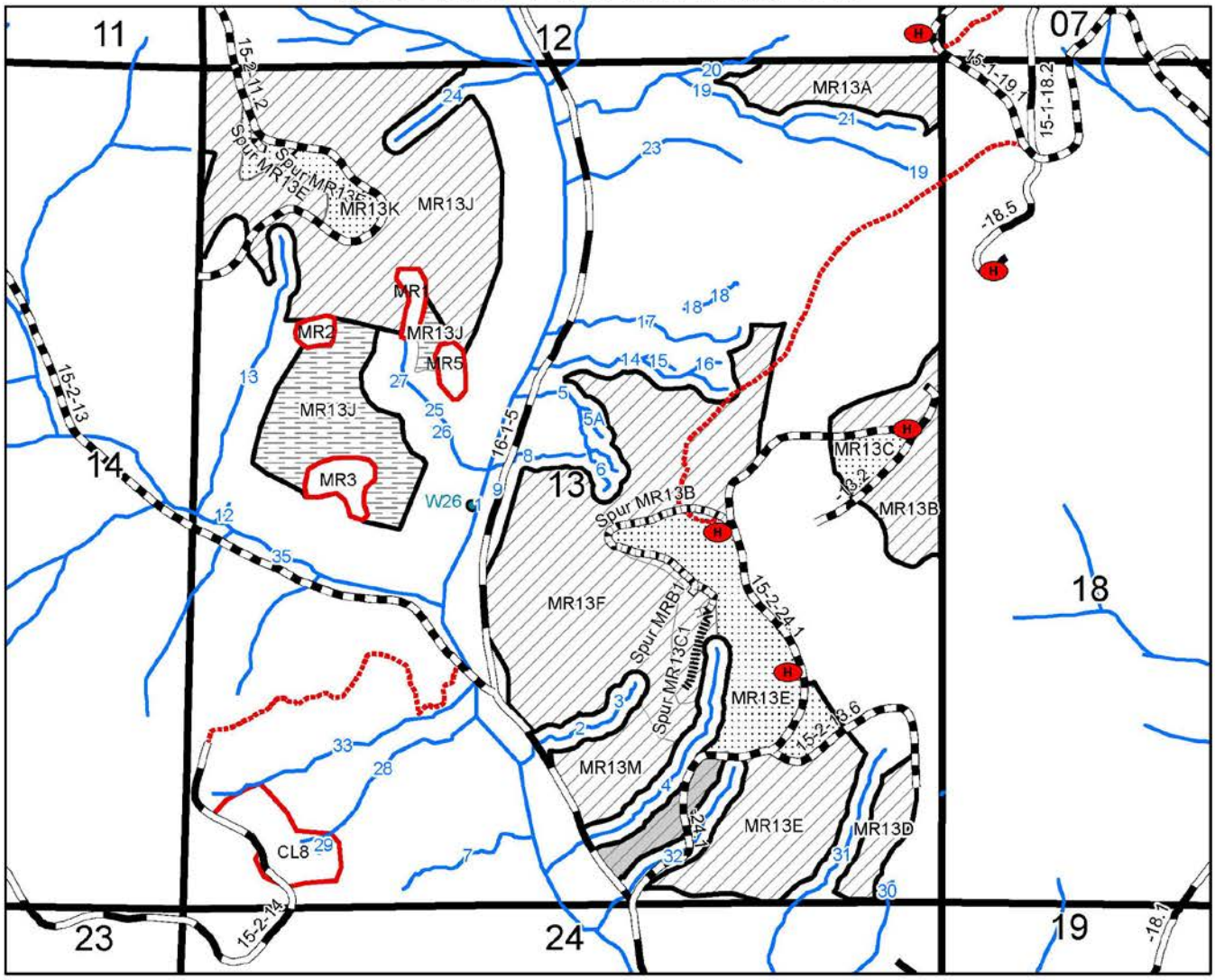
ENVIRONMENTAL ASSESSMENT
MIDDLE RIDGE, T. 15 S., R. 2 W., SEC. 13



Yarding - Ground Base
Yarding - Cable
Yarding - Optional Preferred Cable
Yarding - Helicopter
Partial Harvest Area
Section
TPCC
Existing Road
New Construction - Rock
New Construction - Native
Road Rennovation
HydroLines
Possible Helicopter Landing Sites
OHV

Alternative 3

N

0 500 1,000 1,500 Feet

10/29/2013

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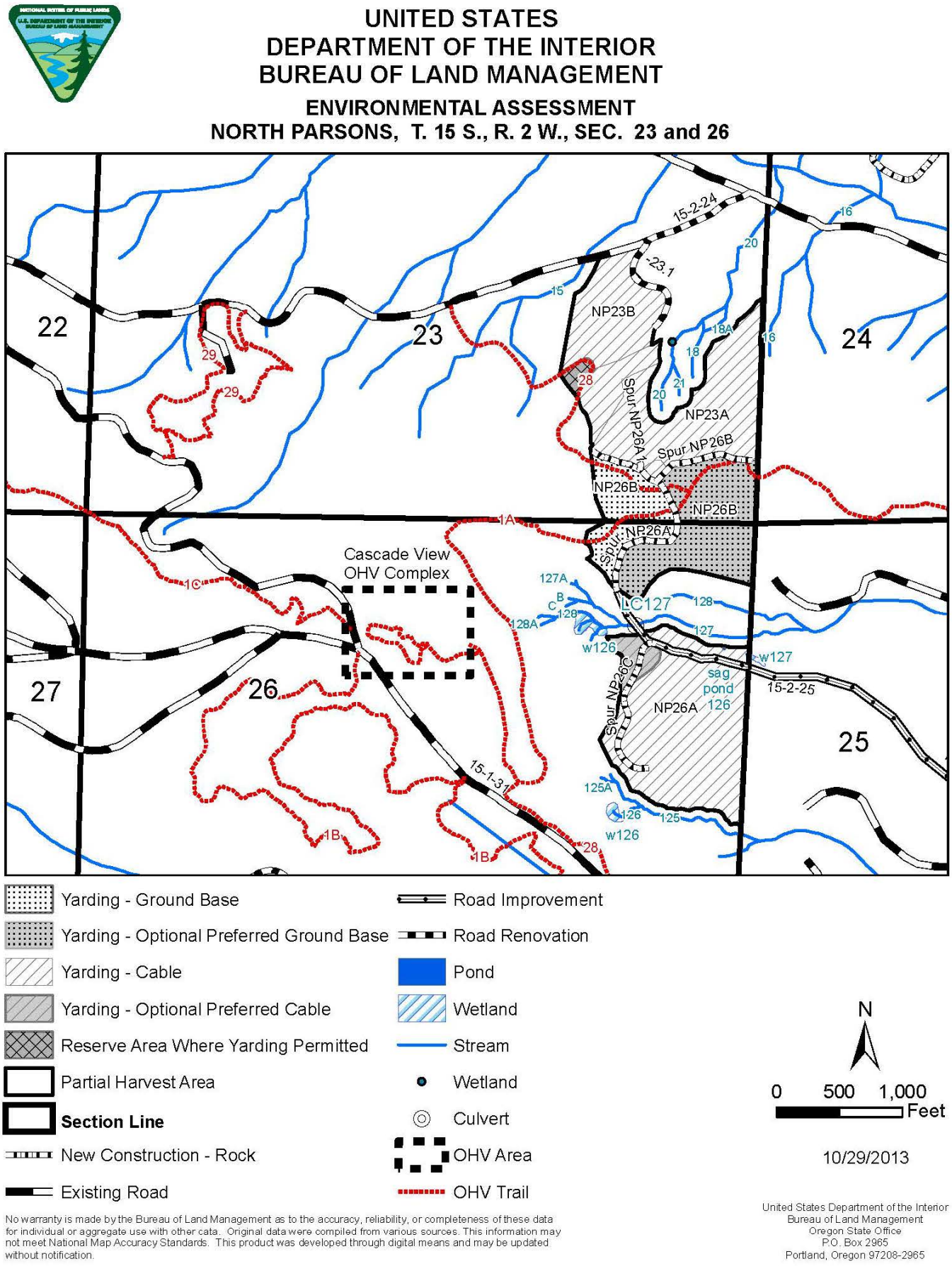
Map 15. North Parsons 23/26 – Alternatives 2 & 3



Map 16. North Parsons 28/33 – Alternatives 2 & 3