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BUREAU OF LAND MANAGEMENT

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MANUAL TRANSMITTAL SHEET

Subject

9115 – 1 – Primitive Roads Design Handbook

1. Explanation of Materials Transmitted: This is a new Manual with associated Handbooks on primitive roads. Attached is the Handbook 1 Section only, per Directives instructions. The Manual and Handbook 2 are under separate clearance sheets for each.

2. Reports Required: None.

3. Material Superseded: None.

4. Filing Instructions:

REMOVE

None.

INSERT

All of 9115-1 – Primitive Roads Design Handbook
(Total 6 Sheets)

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H-9115-1 PRIMITIVE ROAD DESIGN HANDBOOK

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- .1 Design. Design of primitive roads does not require the same detail used in road design. For the most part, primitive road design can be handled in the field along with “P” line surveys (utilizing ‘points of intersection’ without curve layout). Balanced earth quantities are not of primary importance, but is encouraged, so cross sectioning is not required. A typical section may be used as a guide in construction. This should be shown with the alignment on the plans. In spite of the simplicity, there should be a record of the design and it should be transferred in the plans and specification. This process should be used in both contracting and force account work.

Bureau primitive roads are designed and constructed primarily to support the protection, development, use, and administration of public lands and resources with minimum impact on the environment. Designers of primitive roads must recognize possible impacts on the environment which could be caused by the accumulation of drainage, changes in runoff patterns, or removal of critical vegetation; and proceed with their design accordingly. Bureau primitive roads must ensure the safety of a prudent user, but should respect the natural setting of the area. Designers of Bureau primitive roads must be sensitive to national policy emphasizing safety, esthetics, protection and preservation of historic and cultural values; and incorporate these considerations in their designs.

Dimensions of a primitive road should be designed for minimal impact, typically a 12 ft (single lane) travel width.

- .2 Surveys. When a survey is determined necessary for a primitive road, follow the guidelines below:
 - A. Precision of Surveys. Refer to BLM Handbook H 9113-1, Illustration 1 – “Precision Requirements for Road Surveys”. Traverses not requiring easements are to precision class E; Traverses for easements require precision class C; and cross sections require precision class F.
 - B. Stationing. Establish a stationing system for your survey with a maximum 100 foot interval.
 - C. Topographic Survey. Locate existing built features (buildings, fences, utilities, existing road, etc.) and natural features (rock outcrops, streams, swamps, lakes, trees, and cacti to be preserved, etc.) that require special design considerations or that may affect construction operations. Show these features on the construction drawings.
 - D. Section Corner and Boundary Ties. Centerline traverse surveys should be tied to the Public Land Survey System (PLSS) when easements, withdrawals or mixed ownership are integral to the primitive road location.

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- .3 Clearing. Clearing for primitive roads construction varies according to the value of the asset to be built. Generally, primitive roads should be cleared of all projecting limbs, brush, down logs, and debris that endanger a prudent user. In sparsely timbered country, do not remove any healthy trees unless they interfere with traffic, and the primitive road cannot be relocated to eliminate the interference.
- .4 Drainage Elements. Proper drainage is critical in primitive road design. Protection of the travel way, adjacent upstream and downstream lands depend upon proper drainage design. This requires basic knowledge of both hydrology and hydraulics. The design of primitive roads may include the use of culverts, ditches, water bars, and other drainage elements to handle runoff and protect adjacent land from environmental damage.

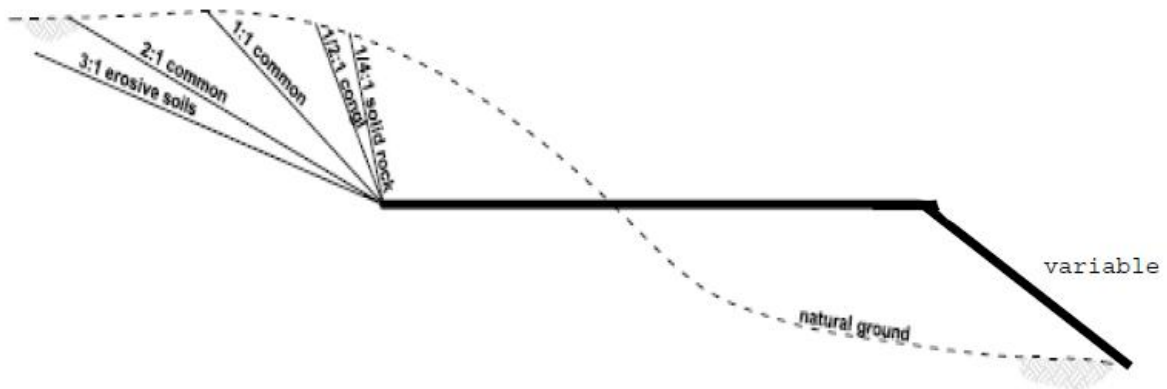
Provide for surface drainage with grade dips and outsloping. Provide cross drainage with water bars, ditching, built-up rock, and culverts as needed. In designing a grade for a section of primitive road, leave sufficient “slack” to permit grade dips at proper intervals without making the intervening sections steeper than the recommended maximum grade. Exact location, length, and configuration of the dips should be staked in the field before earthwork is started. Control of water at the discharge point must not be overlooked. Rocks and native materials are generally in plentiful supply and are effective in dissipating the water and controlling erosion.

In order to divert water from natural trends, the following criteria for water bar and dip spacing is suggested:

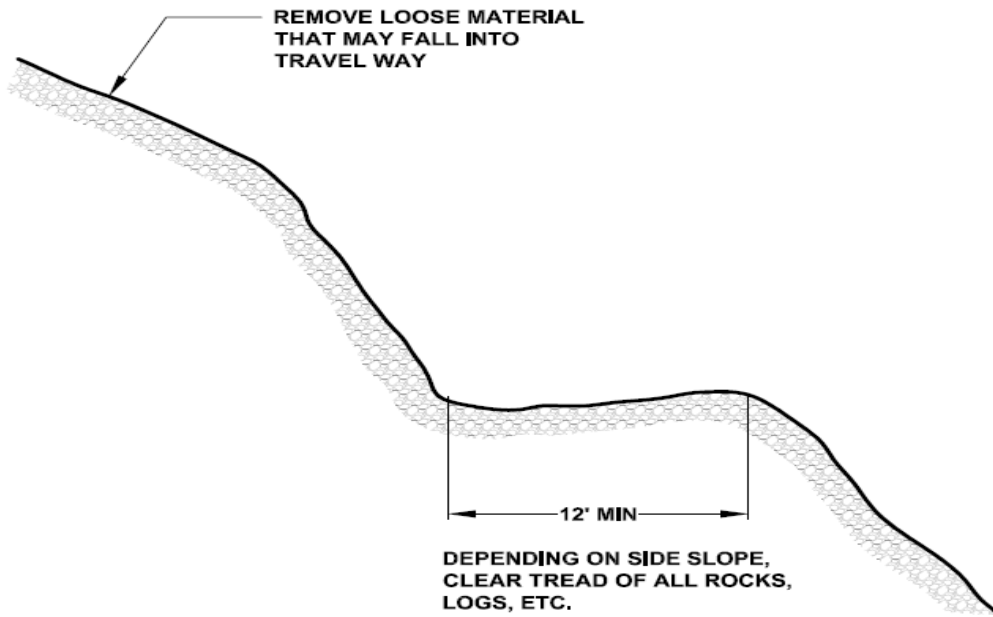
Water Bar and Dip Spacing (feet)			
Primitive Road Grade	Sandy Loams Loams	Decomposed Granite and Sands	Clay and Silty Soils
2-3% (-)	-	2000-1000	1200-600
4-7%	1200-600	950-450	600-300
8-10%	550-450	450-350	300-200
11-15%	400-300	350-200	220-100

- .5 Earthwork Design. Although not of primary importance, BLM encourages balanced design for primitive roads. Waste is discouraged unless soil characteristics are unsuitable for vehicle loads. Borrow should be limited to surfacing materials where needed. Adjust alignment, gradient, or slopes to minimize the need for waste or borrow.
- .6 Alignment and Backslopes. Alignment of primitive roads should consider elements such as surrounding terrain, grade, cross slope and sight distance. Turnouts on primitive roads are recommended as feasible.

Make the primitive roads backslope as steep as the soil material will stand, without causing serious erosion. While most soils will stand with a ½:1 or ¾:1 backslope, this is not always true over time. Be careful to use an angle of repose that will maintain a stable condition indefinitely.



SIDE HILL SECTION



FULL BENCH TREAD

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- .7 Erosion Control. Erosion control is an important consideration on steep slopes. When steep cut slopes or embankments are constructed in erosive soils, methods to control erosion should be employed. Erosion control can be permanent (rock, fabrics, grids, concrete) or temporary (straw mats, hay bales, brush piles or plantings).
- .8 Soil Surveys and Material Site Investigation. The extent of survey and sampling and testing work required depends on the type and size of the project and the character of the soils. Visual classification is sufficient for most primitive roads. Visual soil investigations and classifications should be done through use of the Unified Soil Classification System.
- .9 Specifications, Drawings and Cost Estimates. Specifications and construction drawings must describe the location, design and work to be accomplished in sufficient detail to ensure the project is constructed according to the designer's intent. Design documents should be prepared regardless of how construction will be implemented (Contractor, Force Account, permittee or lease holders). Materials and methods of construction must meet or exceed the quality required by the designer. Refer to Manual Sections 9102 - Facility Design, and 9103 - Facility Construction.
- .10 Permits. Permits (i.e. Stormwater Discharge Permit) may be required whenever a Bureau primitive road intersects with a Federal-Aid, county, or municipal highway. US Army Corps of Engineers Section 404 Clean Water Act permits (such as the Storm Water Discharge Permit) may be required for stream crossings or construction in streambeds. Determine permit requirements and secure any needed permits in a timely manner in order to prevent construction delays. Permits that contain provisions affecting construction methods or schedules must be addressed in the plans and specifications.
- .11 Construction. Primitive roads may be constructed by contract, force account, permittee, or lease holders. When work is done by contract, the crew planning and organization is the responsibility of the contractor. Inspection and inspection record requirements are the same in either case.
 - A. Turnouts: Turnouts are best located on points, in gullies, or ravines. Construct them where indicated by locator, but adjust to take advantage of points and ravines. Keep in mind that turnouts should be intervisable on steep, single lane segments.
 - B. Fords: Fords are generally selected rather than constructed, but sometimes some improvements are required to minimize damage to the stream channel.
 - C. Grade Dips: Grade dips are sections of the primitive road where a shorter piece, generally not over 8 to 10 feet, has been built with a grade slightly adverse to the prevailing grade of the route segment. This prevents the flowing water from passing that point. The primitive road is steeply outsloped at the lowest point in the dip to divert the water from the travelway. Grade dips are the most satisfactory when they are built in the original construction and the designed grade allows for the adverse section to be built in a cut

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section.

- D. Water Bars: Water bars are generally made with 6 to 8 inch diameter treated log laid at a slight angle to the travel way, and fastened in place with heavy stakes, posts and steel pins. Light rods or 9 gauge wire may be used for reinforcing or tie down. Downgrade from the water bar, make the tread flush with the top of the log. Upgrade, make the tread approximately at the center of the log. Immediately above the water bar, slope the outer edge of the primitive road outward to permit release of the water. When constructing water bars, take advantage of natural breaks in the ground surface, which will provide good drainage with minimal disturbance.