14 - TRANSPORTATION AND OTHER FACILITIES MANAGEMENT

Transportation and other facilities are developed to serve National Forest System lands and resource management programs.

Planning for transportation and other facilities is a complex process. Roads, trails, LTFs, sort yards, and camps intended for the access and management of National Forests are planned, located, designed, constructed, and maintained to meet long-term forest management needs and objectives. Legislation, policy, directives, and Forest Plans develop general objectives. Specific objectives are developed by an interdisciplinary team during project planning and determined by the deciding official.

The environmental effects, economic analysis, and recommendations from the interdisciplinary team are considered prior to a decision by the Line Officer. The NEPA document resulting from the environmental analysis discloses the purpose and need for the facility. Road Management Objectives and Road Cards are used to develop and document design standards, erosion control measures, and the road operation and maintenance standards. Additional review may be required in the design phase to ensure meeting the road management objectives.

The two primary instruments for road construction are the public works contract and the timber sale contract. Each contract has its own line of authority (See FSH 2409.15, R-10 FSH 2409.23; and FSH 6309.11 for details). Both contracts use the same road construction specifications. Some road and facility construction are also performed under special-use permits.

During road construction, a Contracting Officer (CO) and the designated Contracting Officer's Representative (COR) or Forest Service Representative (FSR) are identified for each project. These personnel ensure that the project is constructed according to contract specifications and drawings. Inspections and monitoring may indicate that project implementation changes are needed to make the application of site-specific BMPs more effective for water quality protection. Contract changes are done through the appropriate contract line of authority.

Periodic reviews and condition surveys of selected projects evaluate construction performance, the effectiveness of specific design features or treatments to control erosion, and the appropriateness of the level of maintenance. Reviews provide a feedback mechanism to improve future road construction and maintenance by modifying designs, specifications, typical sections, or erosion control practices, and identify current maintenance needs.

14.1 – PRACTICE: Transportation Planning

1. OBJECTIVE. To assure soil and water resources are considered in transportation planning activities.

2. EXPLANATION. This is an administrative practice. Transportation planning is included as an integral part of the Forest planning and implementation processes. In some cases, construction or reconstruction of a transportation facility may require a separate NEPA document. Transportation systems will be planned to achieve an optimum balance of minimum environmental effects with minimum, overall long-term cost, while meeting the land and resource management objectives, user safety, and protecting the basic soil and water resources.

Transportation planning processes develop, evaluate, and document alternative ways of providing access, and different strategies for travel management. Risks and effects on water quality are considered in the alternatives, including different transportation modes, alternative road locations, different routes, designs, materials, road density, and methods of achieving access without roads (helicopter, swing yarding, etc.), or a combination. The options for travel management include encouraging use, accepting use, discouraging use, or closing or blocking roads.

The evaluation includes the social, environmental, and economic characteristics of each access alternative (the physical, biological and human dimensions of ecosystem management). Line officers weigh the risks and effects of the alternatives, including the potential effects on water quality, in setting the intended purpose and need (Road Management Objectives). No implementing activity is undertaken without the line officer's approval of the Road Management Objectives.

3. IMPLEMENTATION. An interdisciplinary process evaluates watershed characteristics and estimates the response of soil and water resources to proposed transportation alternatives and activities. Evaluation will be made using the most current soil and water resource surveys, site specific information, and, where needed, on-the-ground review. The NEPA documentation identifies specific mitigation measures recommended to protect soil and water resources and discloses the expected effectiveness. The decision by the responsible official identifies the selected alternative and mitigation that will be used. Road Management Objectives document the intent for the future management of the road. The subsequent contract will include provisions to meet water quality, soil, and other resource protection requirements as directed by the line officer's decision.

4. REFERENCES. FSM 1950, 7700, and 7712; Forest Plans.

14.2 – PRACTICE: Location of Transportation Facilities

1. OBJECTIVE. To ensure soil and water resources protection measures are considered when locating roads and trails.

2. EXPLANATION. This is an administrative and preventive practice. User safety and the avoidance of unstable, sensitive, or fragile areas are primary considerations incorporated into the location of transportation facilities. These factors can directly affect water quality, soil, and other resource values. Location of transportation facilities is dependent on many other BMPs. The following coordination instructions apply to all transportation related activities:

a. Location activities will utilize the interdisciplinary process to evaluate effects of transportation development and operations, and recommend measures to minimize adverse impacts.

b. Where practicable, avoid locating roads, trails, and access to LTFs within riparian areas, wetlands, floodplains, alluvial fans and outwash areas. Other high-risk considerations in access are large V-notch ravines, and slopes with a high V-notch frequency, landslide prone and snow avalanche zones, and soils with low strength. Generally, ash and glacial fluvial deposits have low strength.

c. Where practicable, roads should cross wetlands, floodplains and alluvial outwash areas in the narrowest, most stable locations. In most instances braided channel areas should be avoided. Locate crossings perpendicular to the stream channel where appropriate, considering user safety.

d. Where practicable, avoid locating road intersections in wetlands (see BMP 12.5).

e. Transportation facilities should avoid sensitive karst features such as sinkholes where sediment and debris may gain entry to subsurface stream systems.

3. IMPLEMENTATION. An interdisciplinary process will be used to develop transportation corridor limits and controls that address water quality standards. When appropriate, a field review by resource specialists should be conducted for areas of concern prior to road survey and design. Measures needed to protect soil and water resources will be identified through an interdisciplinary process. Contract provisions will be prepared that meet the soil and water resource protection requirements.

4. REFERENCES. FSM 7710 and 7720; FSH 7709.56; 1985 Forest Service Specifications, EM-7720-100R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; Clean Water Act Revisions of 1986-Section 407. Log Transfer Facilities; Alaska Timber Task Force Log Transfer Facility Guidelines, Oct. 21, 1985.

14.3 – PRACTICE: Design of Transportation Facilities

1. OBJECTIVE. To incorporate site-specific soil and water resource protection measures into the design of roads and trails.

2. EXPLANATION. This is an administrative practice. The Alaska Region normally utilizes an "overlay construction" method with a thick layer of rock fill or other material (stumps, branches, geotextiles, or other light weight fills) over weak, uncompacted subgrades (elsewhere called "subgrade reinforcement"). In appropriate topography and soil types, a balanced road design is utilized to minimize excavation and soil and water resource impacts. There are several considerations that must be incorporated into the design of roads and trails for the protection of water quality, soil, fish habitat, and other resource values. The following guidelines apply to all transportation activities.

a. Design roads and trails to meet the overall transportation plan, based on traffic, material availability, and safety requirements. Design to prevent or minimize soil movement and sedimentation, as well as undue disruption of water flow. Seek to maintain natural drainage patterns.

b. Design roads and trails to drain with the appropriate use of crowning, outsloping or insloping with cross drainage and grade changes. Design and locate relief culverts, rolling dips, and roadside ditches to protect the running surface, excavation, and embankment. Place a sufficient number of relief culverts to avoid saturation of potential slide areas and erodible soils. Design road and trail drainage to deposit sediment prior to entry into surface waters or karst features. Avoid changing natural drainage patterns.

c. Design side hill cuts and fills to minimize soil displacement, especially adjacent to drainage ways and stream courses. When encountering unstable soils and high water tables, design road prism to minimize loading the slope (see BMP 12.5, 14.7 and BMP 14.17).

d. Assure to the extent practicable, that surface and subsurface water flows that enter caves or other significant karst features are not altered.

3. IMPLEMENTATION. The NEPA decisions identify specific mitigation measures needed to protect soil and water resources and evaluate their expected effectiveness. The line officer's decision identifies the selected alternative and mitigation that will be used. The subsequent contract or permit includes provisions to meet water quality, soil, and other resource protection requirements as directed by the line officer's decision.

4. REFERENCES: FSM 7710 and 7720; FSH 7709.56; 1985 Forest Service Specifications, EM-7720-100R and EM-7720-100B: Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; T-Specifications for Prehaul and Road Maintenance, Clean Water Act Revisions of 1986-Section 407, Log Transfer Facilities; Alaska Timber Task Force Log Transfer Facility Guidelines, Oct. 21, 1985. FSM 7114 - Multiple Activities Analysis, Geologic Hazard Evaluation; R10-TP-9 Geotechnical Investigation and Analysis for Structures Guidelines; R-10 Admin Doc. #150 - Guidelines for Investigation and Design of Earth Reinforced Structures. Roadway Drainage; Guide for Installing Culverts to Accommodate Fish, R-10 Admin. Doc #42, 9/79; Hydraulics of Bridge Waterways, Hydraulic Design Series No. 1. (1973).

14.4 – PRACTICE: Location, Permitting, and Design of Log Transfer Facilities (LTFs)

1. OBJECTIVES. Locate and design log transfer facilities (LTFs) to minimize impacts on soil and water quality.

2. EXPLANATION. This is an administrative and preventive practice. LTFs provide connections between roads and water transportation of timber resources in Southeast Alaska and Prince William Sound.

Siting of LTFs requires permits from several agencies. Permits required include tidelands permits, solid waste permits, COE 404 (fill on wetlands) and EPA 402 (NPDES) permits, State 401 certification and consistency with Alaska Coastal Management Program (ACMP).

Location of LTF sites involves transportation and environmental analyses of the road systems tributary to the facility and site-specific siting considerations. Required information includes: (1) preliminary subsurface evaluation; (2) an inventory of salmon and herring spawning areas; (3) identification of areas protected from wind and adverse sea and swell conditions; (4) existing upland facilities; (5) safe access to the facility from the uplands; (6) tidal flushing to promote submarine bark dispersal; (7) the site's biological productivity; (8) sensitive habitats; (9) safe marine access to facility; (10) storage and rafting areas; (11) eagle nest locations; (12) small craft anchorages and use areas (gill-netting, etc.); and (13) effects of earthquakes.

Construction and operation involves consideration of: (1) longevity of the site; (2) timber volume; (3) timing of construction and operations; (4) bark accumulation; (5) solid waste disposal; (6) method of placing logs in water; (7) surface drainage; (8) control of hydrocarbons (oils); (9) onshore log storage; and (10) facility maintenance and reclamation. (See BMP 14.5, 14.9, 12.17, 14.25, and 14.26.) For example, some ramp LTFs may include rails to keep the loader tongs free and control speed to 3 feet per second or less for log entry into water.

Storm water discharge permits under CWA Sec. 402 are routinely obtained from the EPA. A monitoring plan is developed and implemented to detect and evaluate possible effects of bark accumulation, oil sheens, and surface runoff. NPDES permits require monitoring of bark accumulations when the site is used to transfer logs.

3. IMPLEMENTATION. The environmental analysis utilizes an interdisciplinary team to ensure that management needs, objectives, requirements, and controls are incorporated into the location of LTF. Criteria needed to protect soil; the IDT process identifies water and biological resources. Detailed mitigative measures are developed in the environmental analysis and refined through the permitting process. Contract provisions and drawings will be prepared that meet the soil, water and biological requirements. Consult with State and Federal agencies having expertise in marine and intertidal ecosystems.

LTFs should be sited to avoid locations where fish spawn. Permits issued for LTFs include stipulations developed from data and agency concerns. This planning process is described in the Alaska Timber Task Force Log Transfer Facility Guidelines, dated October 21, 1985.

4. REFERENCES. FSM 7710 and 7720; FSH 7709.56; 1985 Forest Service Specifications, EM-7720-100R and EM-7720-100B: Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; T-Specifications for Prehaul and Road Maintenance, and T-845; Clean Water Act Revisions of

1986-Section 407, Log Transfer Facilities; Alaska Timber Task Force Log Transfer Facility Guidelines, Oct. 21, 1985. FSM 7114 - Multiple Activities Analysis, Geologic Hazard Evaluation; R10-TP-9 Geotechnical Investigation and Analysis for Structures Guidelines; R-10 Admin Doc. #150 - Guidelines for Investigation and Design of Earth Reinforced Structures.

14.5 – PRACTICE: Road and Trail Erosion Control Plan

1. OBJECTIVE. Develop Erosion Control plans for road or trail projects to minimize or mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities. Ensure compliance through effective contract administration and timely implementation of erosion control measures.

2. EXPLANATION. This is an administrative and preventive - Land disturbing activities usually result in at least short-term erosion. Poorly designed, located, constructed, and maintained roads and trails can cause significant stream sedimentation, especially with coarse sand and finer materials from the running surface. Coarse to fine sands have the greatest adverse effect on fish habitat and often are routed slowly through the stream channel system.

Sedimentation is minimized by effectively planning for erosion control. Roads and trails require a variety of erosion control measures. Many erosion control practices will not only protect water quality, but also maintain road prism integrity and reduce maintenance costs, and improve usability. The location of the road or trail with respect to water bodies and unstable lands governs the degree of stabilization required. Stabilization usually includes a combination of practices that promote the re-establishment of vegetation on exposed slopes, provides physical protection to exposed surfaces, prevents the down slope movement of soil, and controls drainage.

To maximize effectiveness, erosion control measures must be properly applied, in place, and functional prior to the heavy runoff period (October through April). The following are considered erosion control measures when implemented in a timely manner:

a. Measures to reestablish vegetation on exposed soils are usually accomplished by seeding suitable grass and legume species in conjunction with mulching and fertilization. In some situations, treatments may include tree seedling planting, sprigging, or bioengineering.

b. Measures to physically protect the soil surface from erosion or modify the topography to minimize erosion include the use of gravel on the road surface and use mulches, riprap, erosion mats, and terracing on cuts, fills, and ditches as appropriate. Temporary water bars in areas of uncompleted roads and trails can be effectively utilized to reduce sedimentation.

c. Measures which physically inhibit the transport of sediments to streams include the use of slash filter windrows on or below the fill slopes, baled straw in ditches or below fill slopes, silt fences, and catch basins at culvert inlets. Sediment basins with slash filter windrows may be utilized in drainages where peak flows are small and fish passage is not required.

d. Measures that reduce the amount of soil disturbance in or near streams include immediate placement of large culverts (greater than 24 inches in diameter) in live streams prior to crossing stream with rock embankment during road construction. Temporary pipes should not be installed unless sedimentation can be minimized during installation, use, and removal.

e. Even with full implementation of BMPs, it is recognized that some construction practices may result in "degradation" of water quality. A short-term (less than 48 hours) departure from turbidity standards is allowed for construction activities which otherwise fully maintain the water body's designated beneficial uses (See "Degradation" in Terms).

3. IMPLEMENTATION. Erosion control objectives and criteria are developed during the environmental analysis. The design engineer using criteria from the environmental analysis and through consultation incorporates detailed mitigative measures. When standard specifications do not provide the degree of mitigation required, the design engineer will develop special project specifications.

An erosion control plan will be developed by the contractor, as required by the contract, and approved by the Contracting Officer. The plan will be consistent with the approved operating plan or construction schedule.

The Contracting Officer will ensure that erosion control measures are implemented in accordance with the approved Erosion Control Plan. Field reviews and on-site inspection by the Line Officer, Forest Engineer, and resource specialists will identify any additional erosion control measures required to protect the streams that were not recognized during planning or design. Necessary correction measures will be implemented as soon as possible through normal contract procedures.

See BMP 12.17 for more complete discussion of vegetative practices as erosion control measures. An example of an erosion control plan is provided in 14.5 - Exhibit 01.

4. REFERENCES. FSM 7721, 7722, and 7723; Timber Sale Contract Provisions B(T)6.31, B(T)6.5, B(T)6.6, C(T)6.3, and C(T)6.51; 1985 Forest Service Specifications, EM-7720-100R and EM 7720-100B; Public works specifications 50.2, and 100.42; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; Cook, M.J. and J.G. King. 1983. Construction Cost and Erosion Control Effectiveness of Filter Windrows on Fill Slopes. USDA Forest Service Research Note, INT-335; FSH 7709.56b.

14.5 – Exhibit 01

_____ Ranger District

ROAD CONSTRUCTION EROSION CONTROL PLAN

Water Quality Issues	Mitigation Measures	Timing	Implemented/ Date if Appropriate
Insufficient ditch relief culverts. BMP 14 _____ _____ Contractor COR Additional comments:	Install culvert	As identified	_____
Excessive area laid bare and seeding/fertilizing not implemented timely. BMP 12/17, 14.8 & 14.10 _____ _____ Contractor COR Additional comments:	Adjust size of area in relationship to seasonal climatic conditions, or as directed by the Engineer. Seed and fertilize at prescribed frequencies. *Normal Season* Max. Bared Area ____ LF – Pioneered Roadway Max. Bared Area ____ LF – Cutslopes & Sidecast Ex. Frequency: ____ Days max. between seeding finished slopes & bared areas *Outside Normal Season* Max. Bared Area ____ LF – Pioneered Roadway Max. Bared Area ____ LF – Cutslopes & Sidecast Ex. Frequency: ____ Days max. between seeding finished slopes & bared areas	During normal operating season as directed. Outside normal operating season per _____	_____
Unsuitable ground conditions for road construction due to season climatic conditions. BMP 14.6 _____ _____ Contractor COR Additional comments:	Shut down operation or a portion of the operation as directed by the Engineer	As identified.	_____
Unstable slopes due to saturated Soils. BMP 14.6 _____ _____ Contractor COR Additional comments:	Limit blasting during this condition. *Controlled Blasting* Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____	In accordance with _____	_____
Road fill placed over snow. BMP 14.6 _____ _____ Contractor COR Additional comments:	Embankment construction on snow prohibited.	In accordance with Specification 203.	_____

14.5 – Exhibit 01—Continued

Water Quality Issues	Mitigation Measures	Timing	Implemented/ Date if Appropriate
Instream construction activities. BMP 14.6 & 14.14 _____ _____ Contractor COR Additional comments:	Work restricted to fish timing window. Sta. _____ Sta. _____ Sta. _____	In accordance with drawing. Window (____ to ____) Window (____ to ____) Window (____ to ____)	_____
Unsuitable roadway excavation. _____ _____ Contractor COR Additional comments:	Endhaul to designated disposal site. Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____ Sta. _____ to Sta. _____	As specified in 205B.	_____
Disposal Site. BMP 14.12 _____ _____ Contractor COR Additional comments:	Provide adequate surface drainage and erosion protection. Milepost _____, Road _____ Protection type: _____ Sta. _____ Protection type: _____	During development and use of disposal site.	_____
Fill slope in critical stream course. BMP 14.7 _____ _____ Contractor COR Additional comments:	Not allowed unless shown in drawings.	As identified.	_____
Loading unstable slope with log decks, excavation equipment, or other items. BMP 14.7 _____ _____ Contractor COR Additional comments:	Not allowed unless shown in drawings.	As identified.	_____
Saturation of road prism, puddling of water, and surface flow along road surface. BMP 14.20 _____ _____ Contractor COR Additional comments:	Crowning, insloping, and outsloping of road when maintaining/grading road.	As identified and/or directed.	_____
Road surface degradation and erosion. BMP 14.8 _____ _____ Contractor COR Additional comments:	Radial tires with low pressure when specified.	As identified.	_____

14.5 Exhibit 01--Continued

Water Quality Issues	Mitigation Measures	Timing	Implemented/ Date if Appropriate
Erosion of road embankment at culvert inlets & outlets. BMP 14.9 _____ _____ Contractor COR Additional comments:	Place riprap as specified.	Immediately after culvert installation.	_____
Reduced culvert capacity due to crushing or deformation. BMP 14.9 _____ _____ Contractor COR Additional comments:	Install at design minimum depth.	As identified.	_____
Ditch sediment load flowing directly into streams. BMP 14.9 _____ _____ Contractor COR Additional comments:	Install cross drain culvert to discharge on filter.	As identified.	_____
Ditch sediment load flowing directly into streams due to culvert clearing in flowing streams or ditch clearing in actively flowing ditches. BMP 14.9 _____ _____ Contractor COR Additional comments:	When possible confine these activities to the period of July 15 through August 15. If work is done outside this timeframe, construct sediment ponds, install silt fences, or hay/straw bales to mitigate sedimentation.		_____
Ditch and road embankment scour and erosion. BMP 14.9 _____ _____ Contractor COR Additional comments:	Install ditch blocks and riprap lining as specified.	As identified.	_____
Deposition of excavated materials beyond roadway limits or on slopes adjacent to drainages. BMP 14.10 & 14.12 _____ _____ Contractor COR Additional comments:	Confine excavation operation to within roadway, and avoid placing material near drainages.	As identified.	_____
Scour, erosion, and increased sediment/bed-load in stream. BMP 14.14 _____ _____ Contractor COR Additional comments:	Avoid removing large woody debris from streams.	As indentified.	_____

14.5 Exhibit 01--Continued

Water Quality Issues	Mitigation Measures	Timing	Implemented/ Date if Appropriate
Water ponding in ditch line, running over road, or flowing through road embankment. BMP 14.17 _____ _____ Contractor COR Additional comments:	Install culvert.	When bypassing culverts is allowed, install bypassed culverts before end of normal operating season, or within 24 hours as directed by the Engineer.	_____
Construction generated debris obstructing stream channels. BMP 14.19 _____ _____ Contractor COR Additional comments:	Dispose of construction slash and stumps by placing under rock fill, windrowing, scattering, endhauling, or other approved methods.	As identified.	_____
Sedimentation resultant of surface flow in rock quarry, overburden placement, loading & haul vehicles in quarry area, and rock crushing operations. _____ _____ Contractor COR Additional comments:	Develop quarry development and rehabilitation plan that addresses water quality concerns and implement plan.	Prior to entering quarry site for rock production.	_____

Note: This plan will be updated during the life of the contract if water quality issues other than those herein are noted.

Contractor's Representative Date

Contractor's Representative Date

Contractor's Representative Date

14.6 – PRACTICE: Timing Restrictions for Construction Activities

1. OBJECTIVE. Minimize erosion potential by restricting the operating schedule and conducting operations during lower risk periods.

2. EXPLANATION. This is a preventive practice. Schedule soil or stream disturbing operations during periods of lowest probability for erosion, sedimentation, or damage to fish habitat quality. Temporary erosion control measures may be required during construction and shutdown periods to prevent, minimize, or mitigate erosion and sedimentation.

a. Installation or removal of drainage facilities and performance of other contract work which will contribute to the temporary or permanent control of erosion and sedimentation will be carried out concurrent with earthwork operations as closely as practicable. (See BMP 14.5: Erosion Control Plan, for limitations of amount of area being graded, or maximum area to be laid bare, and timing.)

b. Contract provision B(T)6.31 "Operating Schedule" identifies the normal operating season as being the period beginning and ending on the dates stated of any year; see A(T)17. All erosion control measures are required to be in place before the end of the normal operating season, and maintained during operations outside the normal operating season. Provision B6.6 "Erosion Prevention and Control" can also be used for resource protection.

c. General timing restrictions are established to protect water related beneficial uses according to direction in the Aquatic Habitat Management Handbook. Restricted periods are times when construction activity should not occur in the stream or on the stream banks. In stream construction activities and the use of equipment on Class I streams is generally restricted during periods when the risk of damage to fish and their habitat quality is the highest; e.g., when eggs or alevin are in the gravels. Identified Class II and Class III streams may have similar restrictions as the Class I stream depending upon proximity to a Class I stream.

d. Final road fill placed over a snow pack will settle and can cause failure of fills, culverts, and other drainage structures. Road building over snow may be permitted with an approved winter operating plan. Road building in snow is appropriate when the risks and consequences are no higher than with normal summer operations. Overlay construction on moderate terrain, or full bench construction in frozen ground is normally acceptable risks.

3. IMPLEMENTATION. Timing restrictions are identified in the NEPA analysis and subsequently are included as part of the contract controls for the projects. The intent is to maintain water quality and water related beneficial uses, while allowing for the orderly progression of the project. Alternative techniques are encouraged to avoid work in streams during critical periods; for example, using bridge launching noses.

a. Exceptions to the timing requirement, as stated in item #3 above, may be allowed when work needs to occur during the restricted period. Approval of conditions under which the activity may occur is needed, and is generally given by the Fishery Biologist directly to the Timber Sale Administrator or Engineering Representative after site-specific evaluation of the location, particular species of fish, and habitat risk involved. However, if the proposed activity involves a stream listed in the ADFG Catalog of Anadromous Streams, then a decision will be made in consultation with ADFG, documented, and signed by the District Ranger.

b. When building roads over snow, assure that culverts are not bedded in snow and that excess excavation is not placed on snow covered slopes. Plan to redress running surfaces and drainages features after settlement occurs. Winter "snow roads" constructed completely of snow and ice are permissible, but must be breached for drainage before spring thaws.

4. REFERENCES. FAR 52.236-15; Timber Sale Contract Provisions C(T)6.3, B6.3, C6.36, and B(T)6.31; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; USFS/ADFG Letter of Agreement (dated 11/21/91) on Title 16; Aquatic Habitat Management Handbook, FSH 2090.21 (formerly 2609.24).

14.7 – PRACTICE: Measures to Minimize Mass Failures

1. OBJECTIVE. To minimize the chance and extent of road-related mass failures, including landslides and embankment slumps.

2. EXPLANATION. This is an administrative and preventive practice. Road construction in mountainous terrain may require cutting and loading natural slopes. This condition may lead to landslides and/or embankment failures depending on the soil strength, geology, vegetation, topography, and groundwater regime. Landslides and embankment failures have the potential to cause considerable erosion, sedimentation and water quality degradation.

Roadways may change the subsurface drainage characteristics of a slope that may necessitate the construction of subsurface drainage to avoid moisture saturation and subsequent slope failure. Horizontal drains, drainage trenches, or drainage blankets may be used to lower the subsurface water levels and to prevent groundwater from entering embankments. Care must be taken to prevent the incorporation of unsuitable material in the road embankment.

The following guidelines should minimize the potential for mass failures:

a. Conduct subsurface investigations and stability analyses for road and bridge locations where slope instability is suspected. Special construction procedures may be necessary depending on the stability evaluation.

b. When topographic, soil, and drainage conditions allow, design Forest roads with a balanced cut/fill to reduce the amount of excavation and size of fills. Certain areas may require full bench and/or end haul of excavated materials for stability reasons.

c. During roadway construction, blasting is often required and should be strictly controlled in areas with high landslide potential. Overloading explosives can generate fly rock or slope failure. Test shot information incorporated into the blasting plan is included in the specification for roadway excavation and rock quarry development. Assure blasting plans are adjusted if an overload occurs (see BMP 14.18).

d. During road construction, blasting operations will be designed to reduce the risk of mass failure on potentially unstable or saturated soils (see BMP 14.6). Identify potentially unstable slopes by using current methods of stability analysis. Where mass wasting due to blast vibrations is likely, current regional specifications will be used to limit blasting during saturated soil conditions. In the event that a landslide occurs during any blasting operation, road construction or quarry development, the contractor, in consultation with the Contracting Officer, will re-evaluate and adjust the blasting plan. The Forest Service Line Officer, or designated representative, should contact ADEC, Division of Air and Water Quality, directly with information on the location of each landslide event, and describe corrective actions being taken.

e. Manage road runoff by planning adequate drainage facilities to route any concentrated surface flow away from unstable slopes. Concentration of runoff should be minimized on unstable terrain.

f. Clearing widths should be no greater than specified in the road design, including needs for user safety (such as sight distance on curves).

g. Designate disposal sites for all material not suited for, or used in the road fill. Do not place excess materials on slopes with a high risk of mass failure. Provide adequate surface drainage and erosion protection at disposal sites.

h. Road slopes should be treated as soon as practicable, according to the erosion control plan. See BMP 14.5 for Erosion Control Plans.

9. Minimize fill slopes adjacent to designated stream courses.

i. Do not load potentially unstable slopes. Examples of loads are heavy equipment, log decks, stockpiled surfacing gravel, and roadway excavation with excess excavation placed along the road.

j. Utilize grade breaks, crowning, in sloping, or out sloping, of the road as necessary to prevent saturation of the road prism.

3. IMPLEMENTATION. In areas with potential slope stability problems, appropriate staffs are involved in the route location. Geotechnical investigation must be performed to generate design parameters and measures to meet the criteria developed through the NEPA process.

Construct the facilities as designed. Maintain the constructed features during use periods to assure slope saturation is avoided.

4. REFERENCES. FSM 7706.11; 7706.12; 7710; 7720; 7721.55, Amend. 32, (9/78), FSM 7720.51--7 WO Supplement No. 1 (12172), 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; Standard Specifications 203, 212, 605, 613, 619, and 631; Timber Sale Contract Provisions B(T)6.31, B(T)6.62, C6.36#, C(T)5.2, and C(T)5.4; FSH 7709.11, 7709.56b.

14.8 – PRACTICE: Measures to Minimize Surface Erosion

1. OBJECTIVE. To minimize the erosion from cut slopes, fill slopes, and the road surface and consequently reduce the risk of sediment production.

2. EXPLANATION. This is an administrative, preventive, and corrective practice. Road construction exposes soil to the erosive forces of wind, water, and traffic. Surface erosion from roads is greatest the first year following construction. Erosion can occur on cut slopes, fill slopes, and the travelway.

a. Erosion control measures involving revegetation (seeding and fertilization) should be planned and implemented as soon as practicable following disturbance. Reseeding as needed to protect the slopes (see BMP 12.17).

b. An integrated system of collection, control, and dispersal of surface runoff is very important to prevent erosion on fill slopes, travelways, and natural slopes below cross drains and culverts. Mechanical measures include construction of ditches, slash windrows, straw bale dams, erosion netting and fabrics, terraces, benching, riprap, and tackifiers.

c. Traffic causes the surface rock to break down into progressively smaller uncompacted particles. Rock durability and the amount of traffic affect the breakdown rate. Surfacing with durable materials, controlling traffic, and compaction by blading should be employed to reduce the amount of fine particles produced on a road surface.

3. IMPLEMENTATION. Sensitivity to ongoing conditions of weather, soil conditions, and water movement is needed to successfully apply this BMP.

a. In areas where marginal rock quality is encountered, the use of "variable tire pressure" (VTP), or radial tires with uniform low pressure to prevent breakdown of

the surface materials, is encouraged and may be required where rock durability tests indicate excessive breakdown of road surface rock will occur.

b. Construct and maintain water bars on roads to be closed. Water bars are a combination of excavation and mounding of road construction materials, located and designed to divert and disperse water from the road surface. If water bars are designed and constructed to allow high clearance vehicle access, they must be maintained.

c. Employ regular inspection, maintenance, rolling grades, in sloping, out sloping, and other treatments to limit the length of water movement down running surfaces or make surface materials less susceptible to detachment.

4. REFERENCES. FSM 7706.11, 7706.12, 7706.13, and 7720; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Standard Specifications 50.4, 203, 204, 206A, 210, 212, 412, 619, 625, 626, 629, and 630; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; T-Specifications for Road Maintenance; Timber Sale Contract Provisions B(T)6.31, B(T)6.6, B(T)6.62, B(T)6.65, B(T)6.66, C(T)5.2, C(T)5.4, C(T)5.411#, C(T)5.412, C(T)6.6, and C(T)6.62; FSH 2409.15.

14.9 – PRACTICE: Drainage Control to Minimize Erosion and Sedimentation

1. OBJECTIVE. To minimize the erosive effects of concentrated water flows from transportation facilities and the resulting degradation of water quality through proper design, and construction of drainage control systems.

2. EXPLANATION. This is an administrative and preventive practice. Stabilizing the road prism and adjacent disturbed areas can minimize degradation of water quality from sediment generated by the erosive effects of surface runoff. Velocities in the ditches and cross drain culverts can be dissipated before entry into the natural system by design and construction of control structures (see BMP 14.14 and 14.17 for stream crossings and in-channel operations).

A number of measures can be used alone or in combination to control erosion in ditches and at culvert outlets. Methods used to control water and reduce erosion may include: properly spaced and sized culverts, catch basins, ditch-blocks, cross drains, water bars, rolling dips, energy dissipaters, aprons, gabions, and armoring of ditches and drain inlets and outlets. Dispersal of runoff can also be accomplished by rolling the grade, crowning, in sloping, out sloping, or installation of water spreading ditches. The following measures are generally applicable:

a. Riprap culvert inlets and outlets as needed to prevent erosion of the road prism. Velocity dissipation at cross drain culvert outfalls is required to limit erosion and undermining of the road fill.

b. Utilize relief culverts as necessary to disperse road runoff and minimize ditch erosion or saturation of road fills. Maintain natural drainage patterns to the extent practicable.

c. Culverts should have sufficient fill covering to prevent crushing and deformation that will reduce culvert capacity. Except for live streams and designated fish streams, compact materials to provide a suitable foundation prior to installing the culvert on unstable soils. Install diversion culverts prior to seasonal or other prolonged shutdown. When directed, diversion culverts shall be installed within 24 hours.

d. Generally, flow velocity in road ditches should be great enough to carry sediment loads yet not erode the ditch. Ditch material, width, and grade determine runoff velocities and culvert spacing. Discharge from road ditches should be cross-drained to filter areas, rather than flowing directly into streams.

e. Trash racks, drop inlets, and inlet aprons can be installed at culvert inlets to prevent clogging or scour.

f. Ditches and cross drains are not a necessary component of all roads. Where water can be drained without concentrating it in ditches, those techniques are preferred. Examples include out sloped roads and the use of permeable rock overlay to allow through flow.

3. IMPLEMENTATION. Project location, drainage control features and design criteria are determined through an interdisciplinary approach. Detailed mitigation measures are developed during project layout by the design engineer using criteria, concerns, and conditions developed during the environmental analysis in consultation with technical resource staffs as needed. The Contracting Officer and the appropriate line officer assure compliance with specifications and operating plans.

The road locator and the designer work together to provide the initial controls for drainage. Opportunities also occur for refinement and adjustment of drainage control during construction. Construction personnel will consult with hydrologists or other resource staff to develop an understanding of drainage patterns and the effects caused by the construction of ditches, cross drains, and other drainage control features.

Construction administration staff uses road management objectives, road cards, stream protection plans, erosion control plans and other documentation during the administration of construction and reconstruction activities. Construction administration staff implements this BMP by making (and documenting) minor adjustments in alignment, culvert length, and drainage location to best-fit site-specific conditions and protect water quality. Consultation with resource specialists, appropriate documentation, and line officer approval is required for changes that will alter the effects estimated in the NEPA documentation.

4. REFERENCES. Timber Sale Contract Provisions B(T)6.6, B(T)6.66, C(T)6.3, C(T)6.6, and C(T)6.61#; FSM 7721, 7723, 7706.11, 7706.12, 1950, FSM 7721.52, Amend. 32 (9/78); FSH 7709.56b; FSM 2533; FSH 2409.23; "Logging Roads and the Protection of Water Quality" (EPA 1975); 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B;

Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures.

14.10 – PRACTICE: Pioneer Road Construction

1. OBJECTIVE. To minimize sediment production associated with the pioneer road construction.

2. EXPLANATION. This is a preventive practice. Pioneer road construction clears the route of trees, brush, and other unsuitable material in preparation for construction of the final road prism. In overlay construction techniques, stumps are placed in the organic mat or removed in preparation for the placement of the rock overlay. The following guidelines to reduce the risk of sediment production:

a. Construction of pioneer roads will be confined to the roadway construction limits unless otherwise approved by the Contracting Officer.

b. Where practicable, pioneering will avoid undercutting the designated final cut slope, and deposition of materials outside the designated roadway limits. Pioneering will also accommodate drainage with temporary culverts or log crossings.

c. Erosion control work, including temporary road drainage structures, will be completed concurrent with construction activity.

d. To avoid adverse impacts to water quality and aquatic resources, the operation of equipment in live streams will be kept to a minimum through the utilization of best conventional technology and techniques (See BMP 14.17). Crossing Class I streams (anadromous fish streams) or other designated streams with equipment will normally be restricted to a time period that will not significantly affect egg and alevin survival (see BMPs 14.6 and 14.14).

e. The maximum distance that a pioneer road should be beyond the rock road surface will be consistent with contractor performance, terrain, erosion risk, and time of year. For example, pioneering is normally less than 2,000 feet ahead during the normal operating season and 500 feet when near the end of the normal operating season.

f. Disposal of debris from clearing and grubbing will be in accordance with design specification.

g. Use contract provisions to control or stop construction activities in areas where significant or adverse water quality impacts occur.

h. Remove temporary culverts, bridges, diversions, dams, culvert plugs, or elevated stream crossings prior to anticipated seasonal high runoff periods and/or at the end of the operating season.

i. Any installation of side-drains, cross drains, energy dissipaters, dips, sediment basins, berms or other facilities necessary to control erosion will be timely and of adequate design.

3. IMPLEMENTATION. Project administration staff is responsible for assuring compliance with all contract or permit provisions.

4. REFERENCES. Standard Specification 201, 203, 201.05, and 203.05; FSM 7721, FSM 7721.54; Timber Sale Contract Provisions B(T)6.6, B(T)6.65, and C(T)6.3; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures.

14.11 – PRACTICE: Timely Erosion Control For Incomplete Projects

1. OBJECTIVE. To minimize erosion of and sedimentation from disturbed ground on incomplete projects by completing erosion control work prior to seasonal or extended shutdowns.

2. EXPLANATION. This is a preventive practice. The best drainage design and erosion control measures are ineffective if projects are incomplete. Incomplete roads, trails, landings, stream crossings, and construction sites must have erosion control measures in place prior to seasonal or extended periods of shutdown. Preventive measures include:

a. The removal of temporary culverts, culvert plugs, or diversion dams that may cause erosion problems during shut down periods.

b. The installation of adequately sized temporary culverts, side drains, cross drains, diversion ditches, energy dissipaters, dips, sediment basins, berms, debris racks, or other facilities as needed to control erosion.

c. The removal of debris, obstructions, and spoil material from channels and flood plains;

d. Seeding grass, and/or mulching bare areas. See BMP 12.17 for additional details.

3. IMPLEMENTATION. Protective measures will be applied to all areas of erosion-prone, disturbed or bared ground prior to seasonal or other extended shutdowns. When operations are conducted outside the Normal Operating Season, erosion control measures should keep pace with ground disturbance. Prior to seasonal shutdown, any corrective or remedial erosion control measures must be completed.

4. REFERENCES. FSM 7721, and 7721.54, Amend. 32 (9/78); Timber Sale Contract Provisions B(T)6.31, B(T)6.6, B(T)6.65, and C(T)6.6; FAR 52.213-3, 52.236-15, and 4G-52.236-107; Standard Specification 206; 1985 USFS Specifications, EM-7720-100 R and EM 7720-100B; R10 Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures.

14.12 – PRACTICE: Control of Excavation and Sidecast Material

1. OBJECTIVE. To minimize sedimentation from unconsolidated excavated and sidecast material caused by road construction, reconstruction, or maintenance activities.

2. EXPLANATION. This is a preventive and corrective practice. Certain soils that ravel or erode from cut and fill slopes (for example, compact glacial tills, ash soils) can be difficult to stabilize, and represent a major sediment source.

In some cases, layer placement and/or benching may be necessary for stabilization and to obtain the proper dimensions and fill slope ratios. End hauling and retaining structures may be necessary to prevent thin layers of unconsolidated material from being placed on steep slopes.

Normal erosion control (as outlined in BMP 14.8) such as seeding should be supplemented with special mitigation measures such as jute netting, filter fabric, mulching, slash windrows, sediment ponds, straw bale dams, and rock gabions, when appropriate.

Prior to commencing construction, reconstruction, or some maintenance activities, locations for placement of excess excavation material will be approved. These locations should minimize the risk of material entering surface waters, either through erosion or mass failure.

3. IMPLEMENTATION. Plans and specifications include consideration of risks and apply mitigative measures identified in the NEPA process. Geotechnical skills may be needed at any point to identify acceptable risks and effective control measures. Close attention to plans and specifications in construction, reconstruction, and applicable maintenance activities is needed to provide the predicted results. Disposal areas are selected during the design phase in coordination with appropriate resource staffs and line officers. Project administration staff monitors the results, and initiate a change to the current activities if unacceptable impacts are occurring.

4. REFERENCES. FSM 7720.3, 7706.11, 7721, 7721.53, Amend. 32 (9/78); FAR 52.236-09; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; T-Specifications for Prehaul and Road Maintenance, Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures; Timber Sale Contract Provisions C(T)6.221 and C(T)5.4; Standard Road Specification 203.11.

14.14 – PRACTICE: Control of In-Channel Operations

1. OBJECTIVE. To minimize stream channel disturbances and related sediment production.

2. EXPLANATION. This is a preventive practice. During the construction of roads and the installation of bridges or culverts, it may be necessary for construction equipment to cross, operate in, or operate near stream courses. This activity will be allowed only at crossings designated by the Forest Service for the construction or removal of culverts and bridges. Close coordination is needed with the Contractor to minimize damage to the stream and aquatic resources.

3. IMPLEMENTATION. Project location, criteria, and the need for in-stream timing restrictions are identified by an interdisciplinary team. Detailed mitigative measures are developed by the design engineer using criteria from the environmental analysis and through

consultation with resource staffs. Compliance with the management requirements, contract specifications, and operating plans is assured by the Line Officer.

Excavation during the installation of streamside structures (for example, riprap, bridge abutments, bridge guardrails, etc.) are conducted in the following manner to protect water quality:

a. Equipment crossing and use within a live stream channel is minimized utilizing best available, conventional technology and techniques. Equipment crossing of Class I or designated Class II and Class III streams should also be restricted to a time period that minimizes adverse impacts to fish habitat (see BMP 14.6).

b. Sediment-laden water from foundation or other excavation activities is not discharged directly into live streams. Water is pumped or otherwise directed from such excavations to approved settling areas.

c. If the channel is damaged during construction, it should be restored as nearly as possible to its original configuration while minimizing additional erosion.

d. Removal of large, stable pieces of woody debris should be avoided. Unless otherwise approved, the natural streambed adjacent to the structure will not be disturbed.

4. REFERENCES. FAR 52.236-15 and 4G-52.236-107; FSM 2505.1, 5460.1 (R-10 Supp. 32), and 7721; Timber Sale Contract Provisions B(T)6.63, C(T)6.51, and C(T)6.5; E.O. 11988, Flood Plain Management; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures. Roadway Drainage Guide for Installing Culverts to Accommodate Fish. USFS-R10 Admin. Doc#42, Sept. 1979. AHMU Handbook 64.14.

14.15 – PRACTICE: Diversion of Flows Around Construction Sites

1. OBJECTIVE. To identify and implement diversion and de-watering requirements at construction sites to protect water quality and downstream uses.

2. EXPLANATION. This is a preventive and corrective practice. Flow often needs to be directed or piped around a project site. Typical examples are bridge and dam construction. Flow in stream courses may be diverted to facilitate construction, safety, and/or to prevent downstream sedimentation. The diverted flow will be restored to the natural stream course as soon as practicable, within timing restrictions, and before seasonal high flows. Stream channels impacted by construction activity will be restored to their natural grade, condition, stable woody debris loading, and alignment as soon as practicable.

3. IMPLEMENTATION. Diversion needs are identified and mitigative measures are developed to protect fishery values and other downstream uses. Project review by other Federal, State, and/or local agencies and private parties in accordance with appropriate MOA's is customary.

Line officers will assure that design standards and management requirements are implemented. The Contracting Officer assures compliance with contract specifications and plans.

4. REFERENCES. Timber Sale Contract Provisions B(T)6.5, B(T)6.5(d), C6.5, C(T)6.52, C(T)6.3, C(T)6.51, and C(T)6.6; FSM 2505.1, R-10 Supp. to 5460.1; 7721, 7721.54, and 7721.81; FAR 52.213-3, 52.236-15, and 4G-52.236-107; FSH 7709.56b; E.O. 11988, Flood Plain Management; Standard Specifications 100.42; 1985 Forest Service Specifications, EM-7720-100R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures. AS 16.05.870. Appropriate MOA's.

14.17 – PRACTICE: Bridge and Culvert Design and Installation

1. OBJECTIVE. To minimize adverse impacts on water quality, stream courses, and fisheries resources from the installation of bridges, culverts, or other stream crossings.

2. EXPLANATION. This is a preventive practice. In addition to stream crossings on system roads and trails, temporary culverts and bridges are required for all stream crossings on short-term and temporary roads. In-channel excavation is a common requirement for bridge and culvert installation. Excavation and other material and/or riprap should not obstruct the stream course, nor impair the function of the stream crossing structure. Operation of equipment in flowing streams will be kept to the minimum. Logs or other materials should be used when practicable to protect stream banks when operating equipment within or crossing the stream channel (see BMPs 13.16, 14.6, 14.11, 14.14, and 14.15).

Design flow should be based upon design life and risk acceptable to the approving line officer. Stream crossing structures will be designed to provide the most efficient drainage facility consistent with resource protection (for example, fish passage), importance of the road, legal obligations, and total costs. The design may involve a hydrologic analysis to determine conditions that may affect water quality (for example, runoff rates and volumes, flood conditions, flow velocities, sedimentation, scour, and approach and exit channel equilibriums).

System roads will have bridges designed to pass a selected (normally 50 to 75 year) flood event. Culverts for Class I, II and III streams will be designed to pass an appropriate (normally 50 year) flood event, with allowance for expected bed load sediments and floating debris. Where practicable, allowance should be made to minimize stream width restrictions. Design structures to minimize streambed and stream bank erosion. Bridges, bottomless arches, pipe arches and oversized buried pipes are the preferred structure on Class I and II streams.

When combining flow from several small drainages into a single culvert, consider the combined peak flows. If the Road Management Objectives for the road is Level 1 Maintenance (closed), assure that adequate long-term flow capacity is considered and seek self-maintaining systems.

Stabilize and minimize erosion of fine materials deposited near streams. Riprap should be free of weakly structured rock and fines that could become sediment sources.

During excavation in or near the stream course, it may be necessary to use suitable cofferdams, caissons, cribs, or sheet piling. This will usually be the case where groundwater is a significant contributor of water to the excavation site. These structures will be essentially watertight and no excavation will be made outside of them. If water from subsurface strata is not significant, pumping may be used, provided the sediment from the pumped water can be disposed of where it will not re-enter the stream.

Brow logs, filter fabric and wood chinking should be provided on log stringer bridges to contain surfacing materials and to minimize introduction of sediment into the stream channel.

Road material less than 4 inches (at the greatest dimension) used for stream crossing approaches should have proper gradation and compaction to prevent piping within the fill.

Design and install culverts on class I and class II streams to allow fish passage during normal and low flows, and to have minimal downstream scour.

When the stream crossing has served its purpose and is no longer needed, the structure and associated fill will be removed. This work will be accomplished in accordance with BMPs 13.16, 14.6, 14.11 and 14.14 as applicable. Vegetative cover will be reestablished.

3. IMPLEMENTATION. Project location, in stream timing, and criteria are developed in the environmental analysis. The design engineer through consultation, using criteria from the Road Management Objectives and road cards, implements detailed mitigative measures.

The Contracting Officer is responsible for approving the location of temporary roads and facilities, within the criteria and objectives as identified during the interdisciplinary planning process. Line officers approve temporary roads constructed for other purposes.

When a stream crossing is difficult or does not appear to meet standards for non-degration (see "Terms") consider collecting monitoring information on the project.

4. REFERENCES. FAR 52.213-3, 52.236-15, and 4G-52.236-107; Timber Sale Contract Provisions B(T)6.5, B(T)6.5(b), B(T)6.62, B(T)6.65, C(T)6.3, C(T)6.51, C6.52, and C(T)6.6; FSH 2409.15; FSM 2505.1, R-10 Supp. to 5460.1, 7721, 7721.81, and 7721.54; Standard Specifications 50.4C, 100.42, 206.04, 206A.04, and 603.03; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures. Roadway

Drainage Guide for Installing Culverts to Accommodate Fish. USFS-R10 Admin. Doc. #42, Sept. 1979. , Chow, V., "Handbook of Applied Hydrology: (1964) p. 9-59.

14.18 – PRACTICE: Development and Rehabilitation of Gravel Sources and Quarries

1. OBJECTIVE. To minimize sediment from borrow pits, gravel sources, and quarries, and to limit channel disturbance from gravel sources permitted for development within floodplains.

2. EXPLANATION. This is an administrative, preventive, and corrective practice. Borrow pits, gravel sources, and quarries have the potential to become sediment sources due to steep side slopes, lack of vegetation, and/or their proximity to water courses.

Where practicable, overburden is stockpiled for use as surface dressing during the reclamation phase. Drainage design and erosion control measures should consider temporary overburden storage and stockpile areas, and permanent drainage control measures that will be necessary after the site has been rehabilitated. When excavation of the site has been completed on all or part of the area, and the site will not be used again, the sides will be sloped, graded, or scaled and the general pit area smoothed, stabilized, and sloped to drain onto a stable area.
Seeding, mulching, and/or planting are carried out where appropriate. Access roads to the site must also be obliterated or otherwise stabilized (BMP 14.24). If the site will be used again, the above requirements will be limited to those essential to resource protection between uses.

Borrow pits and gravel sources located in flood plains or karst topography require special attention. Floodplains often provide excellent sand and gravel sources. With careful planning and design, and given favorable site conditions, these deposits can be removed with minimal impact on water resources. Under some circumstances, sand and/or gravel removal may alter stream flow characteristics and consequently affect water quality and fish habitat. If the borrow area is subject to periodic flooding, then leveling, shaping, or other special drainage features should be provided for pit rehabilitation. Subsurface flows in karst topography should be considered in quarry site selection, and protected during development and operation.

Potential uses of borrow pits as ponds for waterfowl or fish enhancement are evaluated in the environmental analysis of alluvial borrow projects. ADF&G should be consulted on these projects (see BMP 18.2).

Excavation in flood plains will not take place below the water table unless sediment basins are built to contain the sediment from the dewatering operation. Sediment basins should not be subject to washouts. If excess sediment accumulates in basins, it should be excavated to clean the basin and the sediment removed to an approved site. Overburden and alluvial silts or sands may be stockpiled for surface dressing during pit reclamation. Disturbed areas will be revegetated (see BMP 12.17, 14.5, and 14.7).

Wash water or wastewater flows from concrete batching or aggregate operations are point sources. Water will not be allowed to enter a stream prior to treatment by filtration, flocculation, settling and/or other means. Pollution of adjacent water resources by blasting agents in quarry operations will be addressed in the pit operation plan. Gravel crushing and gravel washing requires an NPDES (Storm Water Runoff) permits.

Blasting in areas having saturated soils may be a source of mass wasting and sedimentation. Overloaded shots, lack of blasting mats, or changes in rock strata can create an overshot. Though occasional overshoots can be expected, compliance with blasting plans will significantly reduce over shots and "fly rock" (see BMP 14.6 [Exp.2]).

3. IMPLEMENTATION. Criteria for the location and suitability of borrow pits, gravel sources, and quarries, along with the associated limits of disturbance and sediment production will be identified through the environmental analysis. Streamside borrow pits should be evaluated, during the environmental analysis, for post-operation utilization as fish habitat (BMP 18.2). Detailed mitigative measures are developed by the design engineer using criteria from the environmental analysis and through consultation with resource staffs.

Project administration staff is responsible for ensuring compliance with blasting plans. Line Officers are responsible for ensuring compliance and for implementing projects to design standards as stated in management requirements, specifications, and plans.

4. REFERENCES. 40 CFR 122.27, FSM 2511, 2505.1, 7706.11, 7706.12, 7721, and 7721.54; FSH 7709.11 and FSH 7709.56; FAR 52.236-09; Timber Sale Contract Provisions B(T)6.31, B(T)6.6, B(T)6.62, B(T)6.65, B(T)6.66, C(T)5.2, C(T)5.23, C(T)5.4, C(T)6.36#, C(T)6.52, C(T)6.6, C(T)6.61#, and C(T)6.62; Water Pollution Control Act, 33 U.S.C. 466; Standard Specifications 203, 210, 611, 624, 625, 626, and 629; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures, R-10 SPS-611.1; 11 AAC 95.325

14.19 – PRACTICE: Disposal of Construction Slash and Stumps

1. OBJECTIVE. To ensure that debris generated during construction is prevented from obstructing channels or encroaching on stream, and sensitive karst features.

2. EXPLANATION. This is an administrative and preventive practice. One or more of the following means will dispose construction debris from roads, trails, and other sites near streams:

a. Windrowing

b. Scattering

c. Use as base mat for rock fill

d. Chipping

e. Disposal in Cutting Units

f. Piling and Burning

g. Removal to Designated Disposal Sites

h. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for firewood

Wetlands and karst features, such as sinkholes, are not used as disposal sites.

3. IMPLEMENTATION. Criteria for the disposal of construction slash and stumps are established either in the environmental analysis, or in the design process. Ongoing inspection during construction activities assures compliance with the drawings and specifications.

Materials accidentally entering streams, wetlands, or sensitive karst features will be removed, provided that the removal will cause fewer disturbances than the effect of leaving the materials.

4. REFERENCES. Timber Sale Contract; FSM 7721.54; Standard Road Specifications 201.05, and 201.03; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures. B6.31, B6.6, B6.62, B6.65, B6.66, C5.2, C5.23, C5.4, C6.36, C6.51, C6.6, C6.601, C6.622.

14.20 – PRACTICE: Road Maintenance

1. OBJECTIVE. To maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, road prism failures, side casting, and blockage of drainage facilities.

2. EXPLANATION. This is a preventive and corrective practice. Roads deteriorate because of use and weather. This deterioration may be minimized through proper and timely maintenance and/or restriction of use.

Inspect all new culverts within 6 months of initial fall and winter high flow events. Identify "critical culverts", where there is a substantial risk of failure or risk of water quality impairment. Inspect these critical culverts at least annually or place on the annual Road Maintenance Plan for Action/Correction. Also inspect culverts in and below timber harvest units at least annually for approximately 3-4 years following timber harvest activities, or until vegetation is firmly established in the vicinity of all drainages and ditches feeding the culvert.

See BMP 12.17 for revegetation of disturbed areas. See BMP 14.8 for measures to minimize surface erosion. See BMP 14.9 for control of road drainage. See BMP 14.22 for closure to use.

Maintenance level 1 roads are maintained to protect the road investment, adjacent land, and water resources. Level 1 roads are closed to cars and trucks using a variety of methods and techniques. When vegetative closure is used, implement measures to assure that water bars, culverts and other road drainage structures will continue to function without the benefit of routine maintenance. Inspect level 1 roads at least bi-annually, except inspect roads with a high risk of erosion annually and after major hydrologic events.

Maintenance level 2 roads are maintained as suitable for high clearance vehicles. Maintenance levels 3 to 5 are suitable for passenger vehicles.

Maintenance measures can include opening closed roads, closing roads, surface blading, resurfacing, establishing rolling dips, crowning, in sloping, out sloping, clearing debris from dips, cross drains, catch basins, culverts, water bars, and ditch blocks for minimizing potential adverse water quality impacts.

Maintenance needs will be reflected in an annual road maintenance plan developed to include all roads under Forest Service control. Individual maintenance plans are established for each timber sale prior to award and are enforced throughout the life of the contract. Maintenance plans are reviewed annually for timber sales when multiple users are utilizing the same roads to determine the commensurate share of each Purchaser, the Forest Service, and other commercial users. Determination is made as to whom is responsible for performing the maintenance, frequency of maintenance, timing of maintenance, and the proper share of funds, materials, or work that each of the remaining users contribute. On cost-share roads, an annual meeting is held to determine standards, responsibilities, commensurate shares, and timing. If the road is subjected to commercial use, the Forest Service may collect deposits to facilitate road maintenance and to equitably assess the maintenance cost of each user.

3. IMPLEMENTATION. Road Management Objectives document the road maintenance levels. The line officer is responsible for the development of the annual road maintenance plan. On most timber sales, maintenance is a Purchaser responsibility and the Contracting Officer ensures compliance.

For permitted activities or when collections are made for road maintenance, the line officer assures compliance. FMS 7731.04 assigns responsibility for maintenance of Forest development roads to the Forest Supervisor.

4. REFERENCES. FSM 7730.2, 7732, 7732.02 (Amend. 32 (9/78), and 7735; FSH 2409.15, 7709.58, and FSH 7709.59; Standard Specification 306.02; Timber Sale Contract Provision C(T)5.4; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures, T-Specifications for Timber Sale Road Maintenance.

14.22 – PRACTICE: Access and Travel Management

1. OBJECTIVE. To control access and manage road use to reduce the risk of erosion and sedimentation from road surface disturbance especially during the higher risk periods associated with high runoff and spring thaw conditions.

2. EXPLANATION. This is a preventive practice. Where all-weather or durable rock roads are not constructed, the unrestricted use during wet weather and spring thaw conditions often results in rutting and muddying of the road surfaces. Runoff from these disturbed road surfaces often carries a high sediment load. Maintenance with machinery of soft, rutted roads often increases the risk for sediment delivery to the stream channel system.

Roads not constructed for all weather use should be closed during saturated or thaw conditions. Where winter field operations are planned, roads may need to be upgraded and maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surfaces. Other options include ice roads and bridges in colder regions. Low-pressure tire use or variable tire pressure technology will reduce sedimentation and rutting, and can allow use of the road when it would otherwise be closed.

3. IMPLEMENTATION. Road closures and traffic control measures should be implemented on all roads when damage or degradation of soil and water resources would occur as a result of use. The District Ranger implements Road management objectives. Traffic activity can be controlled under 36 CFR 261 (see BMP 13.4 and 16.5). The decision for closure is made when the responsible Line Officer determines that a particular resource or facility needs protection from use. Forest Supervisors are responsible for closing roads under 36 CFR 261. Criteria are developed by an interdisciplinary approach as necessary. For contracted projects, the Contracting Officer assures compliance with plans and specifications.

4. REFERENCES. FSM 7731.4; Timber Sale Contract Provisions B(T)5.12, B(T)6.22, and C(T)5.12#; FSH 2409.15; 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; T-Specifications for Road Maintenance, Refer to 36 CFR 261 for closure authority; Forest ORV plans; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures. FSM 1920, FSM 2310, Road Management Plans.

14.23 – PRACTICE: Snow Removal Operations

1. OBJECTIVE. To minimize impacts of snow removal operations on road surfaces and embankments and to reduce the risk of sediment production.

2. EXPLANATION. This is a preventive practice. Forest roads are sometimes used throughout the winter or opened early in the spring for a variety of reasons. The following measures are employed to protect water quality and the road investment.

a. Snow removal will be performed in a manner that will protect water quality, the road surface, and adjacent resources.

b. Snow removal equipment will not blade gravel or surfacing material off the roadway, or under-cut cut-slopes. Ditches and culverts will be kept functional during and following roadway use. If the road surface is damaged, the contractor or permittee will replace lost surface material with similar quality material and repair structures or culverts damaged in blading operations.

c. Snow berms will not be left where they will channelize or concentrate melt water on the road or erosive slopes. Berms left on the shoulder of the road will be removed and/or drainage holes opened at the end of winter operations and before the spring breakup. Drainage holes will be spaced to obtain satisfactory surface drainage without discharge on erodible fills or directly into streams. On in sloped roads, drainage holes will also be provided on the ditch side.

d. Interdisciplinary teams will evaluate the use of de-icing chemicals on paved roads.

3. IMPLEMENTATION. Compliance with permit requirements, contract specifications, and the Contracting Officer or the Line Officer assures operating plans.

4. REFERENCES. Timber Sale Contract Provisions B(T)5.4, C(T)5.46, 1985 Forest Service Specifications, EM-7720-100 R and EM 7720-100B; T-Specifications for Road Maintenance; Standard Specification 203.09; Alaska Region Special Project Specifications for the Construction of Roads, Bridges and other Drainage Structures.

14.24 – PRACTICE: Road Obliteration

1. OBJECTIVE. To reduce sediment generated from temporary or short-term roads and to return the land to production by obliterating roads at the completion of their intended use.

2. EXPLANATION. This is a preventive and corrective practice. Temporary or short-term roads are constructed for a specific short-term purpose, normally less than 1 year. Examples are ski area development roads, logging spurs on a timber sale, and cost share permit roads. Temporary roads allowed to remain in use beyond their prescribed time may be subject to damage, and can become chronic sediment sources.

The Leave Open Temporary road (LOT road) can be prescribed. The LOT road is constructed under the timber sale contract as a temporary road, with specifications for hydraulic structures, and is later transferred to the Forest Service for a few years before being obliterated. The LOT road is managed as a transportation facility before being "put-to-bed" and obliterated. Funding for obliteration can be from collections made during the timber sale.

Effective obliteration is achieved by blocking access, removing all culverts and bridges, and restoring the natural surface and subsurface drainage patterns.

In addition, the following measures may be done:

a. Reshape and stabilize side slopes.

b. Remove rock overlay down to the elevation of the adjacent terrain.

c. Rip sub grade where compaction is identified as a problem.

d. Revegetate the site (grass, browse, or trees).

3. IMPLEMENTATION. For timber sales, the Timber Purchaser accomplishes temporary road closure, stabilization and removal of temporary structures. The Contracting Officer assures compliance with plans and the Timber Sale Contract.

Obliteration of other short-term roads is accomplished by the Forest Service or by permittees. Forest Supervisors are responsible for ensuring that other temporary roads or short-term roads developed by the Forest Service meet design standards and management requirements. Temporary road development on Forest Service lands that are allowed through special use permits and/or easements are subject to the same obliteration requirements as temporary roads on timber sales. District Rangers or their representatives are responsible for assuring that the obliteration of such roads is accomplished.

4. REFERENCES. NFMA Sec. 8(b); Timber Sale Contract Provisions B(T)6.62, B(T)6.5, C(T)6.6, C5.122, C5.46, and C(T)6.61#; Standard Specification 210.02; FSM 2522; FSH 2409.15, and R-10 FSH 2409.23; Guide for Road Closure and Obliteration in the Forest Service, J.Moll, San Dimas Tech Center, June 1996.

14.25 – PRACTICE: Surface Erosion Control at Facilities

1. OBJECTIVE. To minimize the amount of erosion and sedimentation at non-silvicultural facilities through implementation of pollution prevention plan.

2. EXPLANATION. This is a preventive practice. Construction of facilities (sites) will require a NPDES (Storm Water Runoff) permit, if the disturbed area exceeds five (5) acres. A Pollution Prevention Plan is a requirement under the NPDES permits (see BMP 14.26 and 14.27 for Silvicultural point source). Otherwise, prepare an erosion control plan on lands developed for administrative sites, ski areas, logging and field camps, campgrounds, parking areas, and waste disposal sites where ground is cleared of vegetation. Erosion control measures are implemented to stabilize the soil and to reduce the amount of stream sedimentation.

Examples of erosion control methods that could be included in a Pollution Prevention Plan or erosion control plan are: grass seed, jute mesh, tackifiers, hydro mulch, paving, or rocking of roads, water bars, cross drains, and retaining walls.

Site drainage patterns should be designed to control erosion and sedimentation. Sediment basins and sediment filters should be established to filter surface runoff. Diversion ditches and berms should be built to divert surface runoff around bare areas. Construction activities should be scheduled to avoid periods of heavy precipitation or runoff (October - April). All disturbed areas should be promptly revegetated (BMP 12.17 and 14.5).

3. IMPLEMENTATION. Practices to be used are documented in the Pollution Prevention Plan or erosion control plan. See BMP 14.5 for more information on erosion Control plans.

Application for NPDES (Storm Water Runoff) permits and associated Pollution Prevention Plans may be by contractors, but performance remains a responsibility of the land manager.

4. REFERENCES. FSM 2522; FSM 7440; 40 CFR 122. (BMP 12.17 and 14.5); Timber Sale Contract Provisions B6.62, B6.5, B(T)6.6, B(T)6.66, C(T)6.61#, and C(T)6.6;

14.26 – PRACTICE: Daily LTF Cleanup

1. OBJECTIVE. Assure cleanup of bark, debris, or other solid materials daily when accumulations are present. Dispose of the materials in an acceptable manner, to prevent water quality degradation.

2. EXPLANATION. This is a preventive practice. It reflects stipulations in permits and housekeeping requirements in pollution prevention plans that are common in recent LTF permits. Disposal methods may vary with the contents collected. Much of the material removed will function as lightweight fill and may be used for reclamation or recycling by land placement. Hazardous wastes, and oil-contaminated materials are not included in this BMP. See BMP 12.16 for additional discussion.

3. IMPLEMENTATION: The objective is to minimize the bark and the other small materials being introduced into marine waters. Daily cleanup when accumulations are present is intended to keep the site clean and avoid repeated wheel traffic over loose bark. A permit from Alaska Department of Environmental Conservation may be required prior to placement of the removed materials.

4. REFERENCES. T-845 Log Transfer Facility Operation, Maintenance, and Monitoring; 402 Permits issued for Log Transfer Facilities.

14.27 – PRACTICE: Log Storage/Sort Yard Erosion Control

1. OBJECTIVE. To avoid generation of fine particles, and control the overland flow of particles carrying hazardous materials into waterways.

2. EXPLANATION. This is a preventive practice. Log storage and log sort yards, including log-scaling areas, involve the handling and movement of logs and bundles of logs. Loose bark, small limbs, and needles are dislodged in the handling, and are ground into fine particles under the wheels of equipment. Some fine particulate material may also come from trucks, or may be developed by breakdown of the rock surfacing of the yard. If these sites are essential to National Forest Management and cannot be avoided, the following mitigation measures should be employed:

a. Clean debris and bark and other loose material from log storage areas/yards before the depth of loose materials reaches 6 inches (depth of rutting) if the material is liquefying. Cleanup of accumulations will prevent excessive churning of overland flows of water and the generation of fine particulate materials in the yard.

b. Placement of materials removed from log storage/sort yards must be done in a manner that assures water quality protection. Petroleum and solvent contaminated material and hazardous substances must be kept separated from the materials that are removed and treated appropriately (see BMPs 12.8 12.9). Loose materials removed from log storage/sort yards are to be placed in locations where water may decant without direct discharges to streams or other water bodies (see BMP 12.16). Slope the materials to drain and seed slopes and surfaces to maintain stability. Look for sites that can be reclaimed, such as unneeded rock pits, old landings, and similar locations to place loose materials. Assure future needs are considered before reclaiming rock pits and landing. Avoid depositing materials at the edge of sort yards or LTF clearings to prevent killing trees and extending the yard size.

c. Use filter strips where possible along log sort yards and log storage areas. Filter strips have good efficiency in settling and removing small particulate material from overland flows. Directly disperse overland flows from log storage/sort yards through vegetated filter strips. Assure filter strips are large enough to perform for several years. Where filter strips are not practicable, provide settling ponds or sediment traps.

3. IMPLEMENTATION. The avoidance practice suggests that in the planning and implementation of timber sales, log sort yards will not be constructed unless essential. Log scaling prior to rafting is generally preferred, but may not be practicable at sites with limited space or small amounts of use.

The practices for management of sort yards and storage yards provide for keeping loose materials from accumulating into mire in the yard areas. Decanting the excess water while keeping the solids in place is the objective of the practice.

Loose materials removed can be used as lightweight fill. It can effectively be used to reclaim areas that have been disturbed, such as rock pits and landings. A permit for the placement of the removed material may be required from the Alaska Department of Environmental Conservation. Utilize the IDT process to select sites for the placement of sort yard material that minimizes water quality concerns.

Oil contaminated wastes should not be included in the lightweight fill material, and should be disposed in accordance with applicable regulations. Hazardous substances are not included in these practices.

4. REFERENCES. 40 CFR 122.27; NPDES general permit for storm water discharges, Federal Register Vol 57, No. 175, Sept 9, 1992; Timber Sale Contract Provisions B(T)6.66.

14.5 Exhibit01

Road Construction Erosion Control Plan

**SEE PAPER COPY OF THE MASTER SET
FOR 14.5 EXHIBIT 01**