HARVEST UNIT AND TRANSPORTATION DESIGN STANDARDS
USED FOR THE HARVEST AND HABITAT MODEL

This purpose of this document is to provide the harvest unit and road design standards
used to develop the logging and transportation plans for use in the Harvest and Habitat
Model. The logging and transportation plans were developed through a contract with
Logging Engineering International, Inc. (LEI) of Eugene, Oregon. This contract was
awarded through the normal state contracting procedures, including a formal Request for
Proposals. The contract, known as the “ODF Harvest Unit and Access Delineation
Contract”, covered the entire project area and took approximately one year to complete.

The standards used by LEI to design the harvest units and transportation system are
contained in the Request for Proposal and LEI Project Instructions to their planners. The
relevant sections from both documents are included below.

ODF provided LEI with aerial photos, orthophotos, and GIS data (roads, streams,
ownership, digital elevation models [DEM], etc). LEI used this information to plan all
harvest units and the roads needed to access them. All of the planning information was
drawn on aerial photos then transferred to orthophotos. LEI digitized this information
into GIS layers (the GIS processes for this project were the topic of a 21 page paper

ODF provided a District Liaison (from each district) to work closely with LEI. The
District Liaisons responsibilities included:

• Providing LEI any additional data that they requested;
• Providing LEI with a local contact who could answer questions regarding local
  condition and specific sites;
• Reviewing the drafts of harvest units and transportation plans;
• Recommending final approval of harvest unit and transportation plans.

The District Liaisons were experienced ODF field foresters, who were timber sale
contract administrators. The Contract Administrator (Robert Nall) provided coordination
between the District Liaisons and LEI. The Contract Administrator’s responsibilities
included:

• Providing guidance and interpretation of the design standards;
• Ensuring that the standards were applied consistently on all districts;
• Certifying work as complete and acceptable to ODF.

When LEI submitted draft plans, the District Liaison would review and comment on the
plans, then return it to them. LEI resolved the comments by making changes to the plans
or by discussing with the District Liaison and/or asking the Contract Administrator for a
clarification of the standards.
LANGUAGE FROM THE REQUEST FOR PROPOSAL

DESCRIPTION OF THE FINAL PRODUCT

General Forest Road Plan: A General Forest Road Plan (GFRP) is a plan for the main forest roads that provides access to defined harvest units. Where there are not existing forest access roads, the GFRP will utilize topographic maps, digital elevation models, aerial photos, orthophotos, and other tools to generally locate where the roads could reasonably be constructed to gain access to each harvest unit. A GFRP does not include the location of all spur roads (within a unit), setting boundaries, and/or landings within a defined harvest unit. A GFRP includes basic information for each of the proposed road segments, such as length, average grade, road classification, and approximate construction cost per mile.

Full engineering designs of roads are not completed as a part of the GFRP development. In addition, field reconnaissance is very limited during the initial development of the GFRP.

General Harvest Unit Plan: A General Harvest Unit Plan (GHUP) is a plan for all potential clearcut harvest units within a district. The approximate harvest unit boundaries for the GHUP will be identified utilizing topographic maps, digital elevation models, aerial photos, orthophotos, and other tools. The harvest units in a GHUP are generally between 20 to 120 acres in size and can be logged independently of other harvest units. The GHUP does not identify individual setting boundaries within the harvest units. To the extent practical, each harvest unit is developed around one predominant logging system. The areas that can not be thinned within each unit are identified. A GHUP contains basic information on each potential harvest unit, such as: size, anticipated yarding system, average logging costs, and average within-unit spur road cost.

A GHUP also has delineated units and/or areas within units that are Non-Harvestable. Non-harvestable Units include: a) those areas that can not be accessed for logging using current technology and/or economic conditions; or b) environmentally sensitive sites, where irreversible damage would occur. All lands on a district are either included in a potential harvest unit or a non-harvestable unit.

Policy decisions, such as protection standards for wildlife species, are not generally considered during the development of a GHUP. Field reconnaissance is very limited during the initial development of a GHUP.

STATEMENT OF WORK

A. Develop a General Forest Road Plan by completing items 1, and 2 (below) for State Forest Land on each district.

1. The Contractor will identify new and existing road segments required to complete a GFRP by:
a) Considering the existing district road system (based on information provided to the contractor by ODF),
b) Identifying areas where additional road segments need to be constructed to access all potential harvest units,
c) Identifying reasonable locations for constructing roads by utilizing available data, such as: topographic maps, digital elevation models, aerial photos, orthophotos, and/or other tools,
d) Identifying roads that need to be upgraded from their current class to a higher class in order to carry the anticipated traffic.

2. The roads must meet the following standards:
   a) The Oregon Forest Practices Act, and associated rules and policies, including the Critical Road Policy;
   b) The Aquatic and Riparian Strategies and Standards contained within the Northwest and Southwest Oregon State Forest Management Plans;
   c) The Forest Roads Manual (2000) for the State Forest Program, and specific road location guidance described in RFP Exhibit “A”;
   d) Each new and existing road will be divided into segments at road junctions and timber harvest units:
      i. See the example of the desired product in RFP Exhibit “B”,
      ii. Divide each road into segments that run from road junction to road junction. Road junctions less than 100 feet apart will be considered a single road junction,
   e) Each new and existing road segment must be spatially linked with an existing road or another proposed road;
   f) Assign the attributes defined in RFP Exhibit “C” (GFRP Attributes) for each new and existing road segment,
   g) Record the location and attributes in a digital format as described in the Deliverables section.

B. Develop a General Harvest Unit Plan by completing items 1, 2, and 3 (below) for State Forest Land on each district.

1. Using available data, such as: topographic maps, digital elevation models, aerial photos, orthophotos, and/or other tools, the Contractor will develop potential harvest units that:
   a) Meet the standards in Oregon Forest Practices Act and associated rules and polices;
   b) Are designed with consideration given to the Aquatic and Riparian Strategies and Standards contained within the Northwest and Southwest Oregon State Forest Management Plans;
   c) Will not exceed 120 acres in size and will generally be greater than 20 acres in size;
   d) Allow for minor inclusions of Non-Harvestable areas;

1 Designing the harvest units around these buffers may have increased the number of units or the number of roads (in comparison to the Forest Practices Act), but it did not have a significant impact on the operable acres. The harvest units were “drawn” to the center line of the streams (except for ponds, lakes, sloughs, and other large bodies of water). The area in the riparian management areas were identified in the development of the specific GIS data for each Alternative.
e) Will be designed around a single logging system, as much as possible;

f) Will consider ground, cable (short and long reach), combination of ground and cable, and helicopter logging systems;

g) Assume a clearcut harvest prescription that meets the green tree and snag retention strategies described in the Northwest and Southwest Oregon State Forest Management Plans;

h) Will identify, as separate areas, those portions of harvest units that can not be thinned using conventional methods.

2. The Contractor will identify Non-Harvestable Units by:

a) Identifying Access Limited sites, which include those areas that can not be accessed for logging using current technology and/or economic conditions;

b) Identifying Environmentally Sensitive sites, where irreversible damage could occur;

c) Reviewing and refining the descriptions of Non-Harvestable areas described in RFP Exhibit “D”.

3. The complete General Harvest Unit Plan will:

a) Include all State Forest Lands on a district in either a Harvest Unit or a Non-Harvestable Unit,

b) Have attributes as defined in RFP Exhibit “E” (GHUP Attributes).

C. Development of a General Forest Road Plan and General Harvest Unit Plan will occur concurrently for each basin.

1. The Contractor will develop the General Forest Road Plan and General Harvest Units Plan (as described in A and B above) by:

a) Systematically completing the GFRP and GHUP for each basin. (The basins are either Management Basins or subdivisions of Management Basins designated by ODF, see RFP Exhibit “F” for a complete list of the basins);

b) Providing ODF with a Work Plan that describes the order and approximate time frame in which GFRP and GHUP for the basins will be completed;

c) Reviewing the draft GFRP and GHUP for each basin with the District Liaison and ODF Contract Administrator for approval, prior to proceeding with the next basin, unless approved in writing by ODF;

d) Working closely with the District Liaison during the development of the basin GFRP and GHUP;

e) Collaboratively verifying the proposed roads and the potential harvest units for feasibility and reliability with the ODF District Liaison;

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2 Designing the harvest units in consideration of these leave tree requirements may have increased the number of units or the number of roads (in comparison to the Forest Practices Act), but it did not have a significant impact on the operable acres. The volume of the leave trees was accounted for in the yield tables that are specific to each model.

3 LEII worked closely with the ODF Contract Administrator and District Liaisons to identify clear standards and methods for delineating these areas.
f) Allocating up to 20 field days on Project 1 and 12 field days on Project 2 to conduct the collaborative field verification with the ODF District Liaison;
g) Ensuring overall feasibility and efficiency of the GFRP and GHUP for each new basin through:
i. An evaluation of the overall District GFRP and GHUP, and
ii. Edge matching each new basin with the completed adjacent basins (regardless of District).

**RFP EXHIBIT “A”**

**Road Location for Planning Purposes (not on-the-ground location)**

The following list provides additional guidance for identifying locations of new roads in the GFRP:

1. Preferred locations are on DEM (Digital Elevation Model) slopes under 50 percent and near ridge top;
2. Preferred grades between 6 and 12 percent if side slopes under 50 percent;
3. Use grades up to 20 percent to get roads off slopes steeper than 60 percent and also to get roads away from streams quickly;
4. Grades steeper than 20 percent may be used only for spurs and only where essential to access units;
5. Keep new roads at least 100 from streams when those roads are parallel to streams, with maximum of 500 feet per mile within 100 feet of streams when there are no other alternative locations;
6. Go around significant wetlands except when there are no reasonable alternatives - if there are no reasonable alternatives then roads may cross wetlands for a maximum of 500 feet;
7. No new roads on DEM slopes over 85 percent, or DEM slopes over 70 percent within 200 feet of and parallel to streams. Exceptions require discussion with geotechnical specialist and state forests engineer to determine if additional engineering mitigation might be feasible.

**RFP EXHIBIT “D”**

The General Harvest Unit Plan (GHUP) will identify areas that can not be logged, either because they can not be accessed, or they occur on environmentally sensitive sites. The examples below are meant to serve as a starting point; ODF and the Contractor will work collaboratively to develop better definitions.

**Non-Harvest Access**

Some areas can not be logged using existing technology and/or under current economic conditions. Some examples of Non-Harvest Access areas include:
• Areas where access roads can not be constructed (that meet ODF standards) and are either too small to be a viable helicopter unit or are otherwise unsuitable for helicopter logging;
• A “long corner” or “blind lead” on a cable harvesting unit, for which no viable alternatives exist;
• Cable harvesting areas that must be yarded across a creek that requires full suspension of the logs, but full suspension is not possible and no viable alternatives exist;

Non-Harvest Sensitive

Some areas can not be logged because they are environmentally sensitive and irreversible damage would occur if they were logged. For the purposes of the GHUP, administrative areas may also be included in this category. Some examples of Non-Harvest Sensitive areas include:

• Active landslides, earth flows, or other sites with an unstable landform;
• Inner Gorge Area4 and splash zones of Significant Waterfalls (see Northwest Oregon State Forest Management Plan, page J-12);
• Wetlands greater than 1 acre (see Northwest Oregon State Forest Management Plan, page J-15);
• Non-Silviculturally Capable Lands as shown on the “Land Base Designation Maps” (OAR 629-035-0040);
• Rock outcrops, rock bluffs, talus slopes, and other poor sites where reforestation is likely to fail;
• Administrative sites, such as district offices, rock pits, and power line right-of-ways;
• Recreation sites, such as campground, waysides and interpretive centers.

LEII INSTRUCTIONS TO ITS ENGINEERS

The following section includes LEII’s general instructions to their engineers and the some specific instructions on road locations.

On the photos, plan for an optimum layout of roads and units.

Define settings only where this is necessary for you to properly define a unit. Each unit should consist mostly (roughly 70% +, but not if unit will then be less than 20 ac.) of a single logging system, for clearcut logging. In practice, the (single-system) units that we define could well be combined5 into larger (multi-system) units at the time of layout. There are only 3 systems: ground, cable, and helicopter. Apply these according to the criteria set out in Appendix 3. Helicopter should be applied only in desperation, after

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4 The “Inner Gorges” are the one Forest Management Plan strategy that was specifically included in the harvest unit data. These areas were included because we had no other method to identify them and the Plan specifically prohibits logging on them. In the few areas that they do occur, they generally extend around 100 feet from the stream bank.
5 The Harvest and Habitat Model does accumulate individual harvest units into clearcut operation up to 120 acres in size.
discussion with Greg or Dallas. Inclusions under about 5 acres don’t need to be treated separately. Units generally 20-120 acres.

Show all roads except in-unit spurs; show these only where necessary for your own plan development. No need to show landings except for your own convenience.

Interpret grades from the available topog, as qualified by photo-interpretation. Use a parallax bar only for critical, doubtful locations. Preferred locations are slopes under 50% and ridgetops. Preferred grades 6-12% on ground >50%, but go steeper on steeper ground or to get away from streams. New roads >100’ from streams wherever feasible. Try not to cross wetlands. No roads on slopes >85%, or over 70% within 200’ of streams. Maximum grades:

- **Spurs**: max. 1.5 miles long, 1000 acres: desirable 12% adverse, 16% favorable; none over 18% unless discussed first with Greg or Dallas.
- **Collectors**: access 500-20,000 acres, may leave ODF: desirable 10% adverse, 14% favorable; can go to 18% with Greg’s or Dallas’s approval only.
- **Mainlines**: access 5000+ acres, leave ODF for public road: desirable 10% adverse or favorable; can go to 18% with Greg’s or Dallas’s approval only.

Intermingled Industry lands regarded as friendly territory; try not to encroach, but if you have to, treat as ODF land. Federal land: can cross, but try very hard not to.

Include treed recreational sites as separate units. They will likely be taken out of the plan later.

*The following section describes the logging system standards used by LEII’s engineers to develop the harvest units. LEII and ODF jointly developed these standards.*

Appendix 3

These are all subject to site-specific variation. Economic evaluations are back-of-the envelope at most; assume all clearcut is 50 Mbf/acre. Make sure we have plenty of roads.

Ground:

- Max. 1200’ favorable, 600’ adverse (we will generally be trying for 2/3 of this)
- Favorable max. 35%
- Adverse max. 20%
- Not obviously wet or very broken
- Pull line up to 150’ downhill on steeper ground

Cable:

- Maximize single span, with a little multispan OK for uphill
- Maximum long corner 3000’ uphill (try for much less, say 1200’)
- Maximum long corner 1200’ downhill, with runout and good landing
- Sideblock up to 400’ if good deflection and no buffer issues

Helicopter:
• Max. flight path 5000’
• Max. 20% adverse flight path
• Minimum setting size 5ac.
• Minimum area within 1 mile of landing 30 ac.
• No power lines
• Good service landing

Non-Harvestable:
• Access Limited: systems above won’t work, and/or road access very difficult; try to road entire area.
• Environmentally Sensitive: as defined in RFP Exhibit D:
  o Active slides and very unstable slopes: must look VERY bad on photos
  o Inner Gorges
  o Wetlands
  o Non-Silviculturally Capable (in ODF data)
  o Rock etc. unlikely to regenerate
  o Admin sites incl. utility easements; may not all be in ODF data.
  o Recreation sites: but include as units if they are timbered
  o Small areas effectively surrounded by buffers
  o Road access environmentally precluded—no roads on inner gorges over 70%, elsewhere over 85%; exceptions to Greg or Dallas
• Smallest non-harvestable polygon is about 2 ac.
• NH inclusions not over 20% of unit—in principle

THINNABILITY

• Non-thinnable inclusions OK, up to say 20% if still logical polygons.
• All settings designated for ground systems.
• Cable:
  o Uphill only
  o Max. long corner 2000’
  o Good deflection (up to 2 intermediate supports OK)
  o Assume tail trees will be available
  o Yarding roads close to the fall line
  o Pie-shaped yarding roads OK
  o Landing zone sideslopes <20%
  o Road grade not >10%.
  o Can hang thru stream buffers
  o Combination of the above is important
• Helicopter:
  o Apply with caution
  o 2500’ max. flight path
  o Max. adverse flight path 20%
  o Minimum 50 ac. within 2500’
• Ignore present timber type; purely dependent on the ground