

FLOODPLAIN SURVEY GUIDE

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Biography

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Roger is a Licensed Surveyor in the states of Montana, Washington, North Dakota and California and is registered by ASFPM as a Certified Floodplain Manager. He has 35 years experience as a surveyor working with civil engineers, land surveyors, hydrologists, and general contractors. His range of experience includes data acquisition for flood studies, riparian characteristic analysis, Letters of Map Changes and as part of the FEMA Map Mod DFIRM team. He also has been doing boundary survey, GLO public domain breakdown, certificate of surveys, subdivisions and related utility plans. Field experience has included field supervisor/crew coordination, boundary surveys, construction stakeout, hydrographic, geodetic, environmental and topographic surveys. Roger has provided data acquisition and mapping for numerous wetland delineation, mitigation, floodplain and enhancement projects.

Data Acquisition for Hydraulic Modeling

- Research available data. Utilize aerial photos for accessibility and stream sinuosity.
- Map in a published coordinate system. Use NGS monuments if available. At least two OPUS solutions if not.
- Determine where cross sections are needed. Use “Guidelines for Watercourse Surveys” and consult with hydrologist/engineer.
- Determine equipment to be used. I.E.: Total Station, Boats, GPS, bathometry equipment, sounding lines, safety gear, anchor ropes, camera.
- Don’t under staff the crew. On swift river boat cross sections use a minimum of 4 crew members.
- Extend your cross sections well above anticipated BFE.
- Take pictures of both banks, upstream & downstream for modeler to determine bank roughness.
- Locate high water features. Debris in bushes, sand deposition on point bars etc.
- Tie in stream gauges and replicate gauging cross section if possible. This helps the modeler calibrate the model.

SWAN LAKE CROSS SECTIONS



GUIDELINES FOR WATER COURSE SURVEYS IN ZONE 'A' FLOOD ZONES

- Vertical is more critical than horizontal
- Control points to be leveled through using third order leveling from established monuments were possible. (Closure within $\pm 0.05' \times \text{sq. root of distance in miles}$). When using GPS, redundant occupations are recommended.
- Reference to National Geodetic Vertical Datum of 1929 or North American Vertical Datum of 1988.
- If Bench Mark monuments are not available, multiple OPUS solutions can be accepted.
- Vertical error tolerances of $\pm 0.1'$ across the width of the 100 year floodplain. Total Station, differential leveling and or GPS methods are acceptable.
- Point capture frequency in active channel is a minimum of $0.1 \times \text{channel width}$. I.E. 100' channel = 10' spacing. In Floodplain it is a minimum of $0.05 \times \text{floodplain width}$. I.E. 1000' floodplain= 50' spacing. Always pick up breaks and high water indicators.
- Extend cross section to 10 feet above anticipated 100 year base flood elevation.
- Minimum five cross sections. At least two on the property where BFE elevations are desired. Furthest upstream at the property boundary. The furthest down stream depends on slope of the channel. $<0.001=3000'$, $0.001-0.0049=1500'$, $0.005-0.01=500'$ and $>0.01=100'$.
- Cross sections to be taken perpendicular to general flow of water course.
- Cross section to be taken at significant breaks in ground slopes and floodplain widths.
- If removing a portion of the property from the SFHA is desired, sufficient topography is required to define that floodplain boundary.
- Leave an identifiable stable vertical reference monument near the anticipated building site.

RESEACH SOURCES FOR EXISTING DATA

- NGS WEBSITE FOR BENCH MARKS: <http://www.ngs.noaa.gov/cgi-bin/datasheet.prl>
- FIRMS: <http://maps2.nris.mt.gov/mapper/MapWindow.asp?Profile=1629007&Cmd=Build+Reports>
- TOPO QUADS: <http://maps2.nris.mt.gov/scripts/esrimap.dll?name=LocMap&Cmd=Map>
- AERIAL IMAGES: http://nris.state.mt.us/nsdi/orthophotos/naip_2009.asp
- USGS WATER RESOURCES: <http://water.usgs.gov/>
- GUIDELINES FOR WATERCOURSE SURVEYS:
http://dnrc.mt.gov/wrd/water_op/floodplain/pdfs/guidlines_wcsurveys.pdf
- US ARMY CORPS OF ENGINEERS COORDINATE CONVERSION SITE:
<http://www.agc.army.mil/corpscon/index.html>
- Montana Flood-Frequency and Basin-Characteristic Data:
<http://mt.water.usgs.gov/freq?site=12381400>
- Guidelines and Specifications for Flood Hazard Mapping
<http://www.fema.gov/library/viewRecord.do?id=2206>



USCGS MONUMENTS

BASE YOUR SURVEY DATA ON A PUBLISHED VERTICAL AND HORIZONTAL DATUM. USE THE DATUM THAT THE EFFECTIVE STUDY IS ON

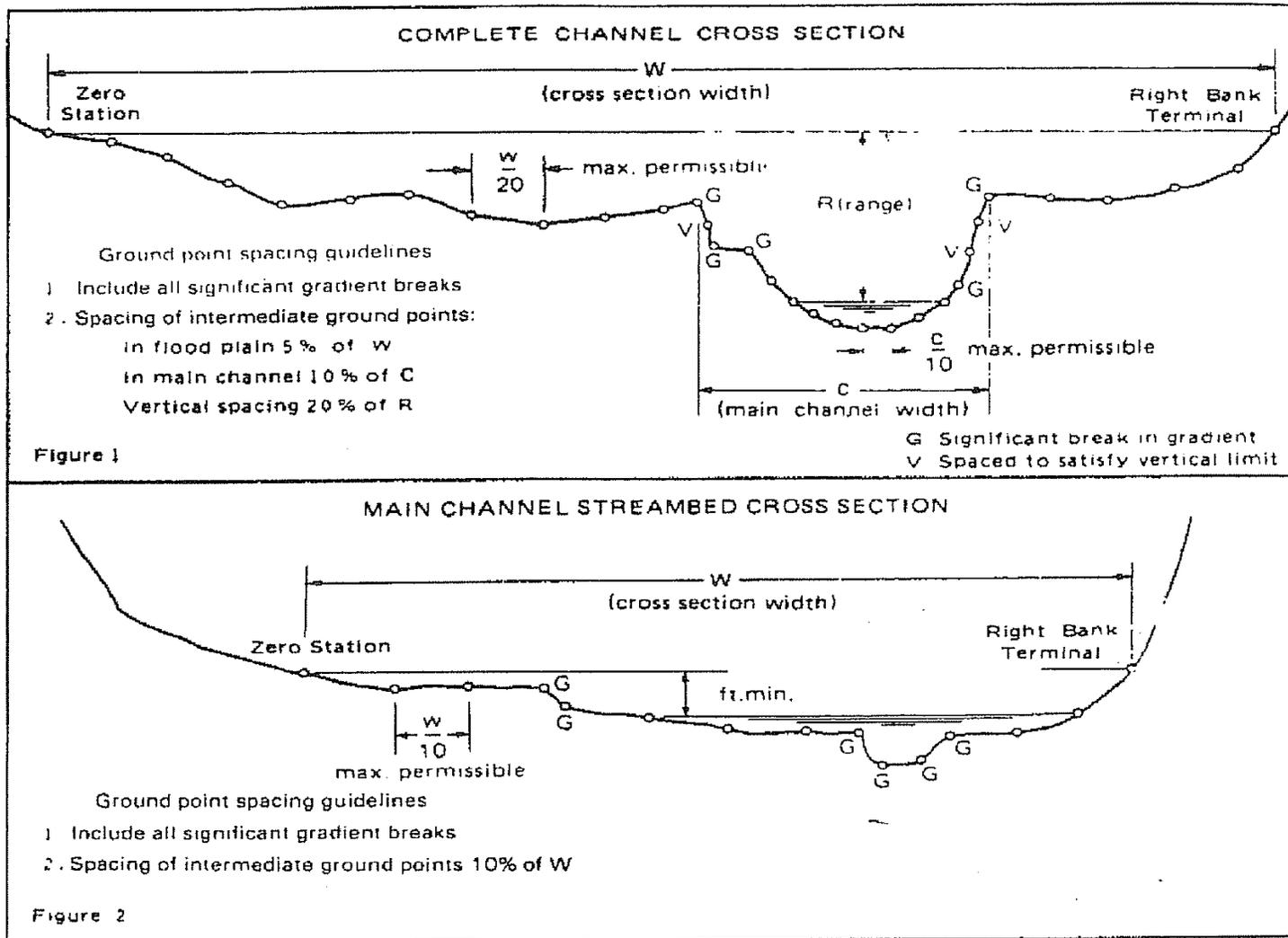


Figure A-2. Examples of Cross Section Ground Point Spacing

FIGURE 1 - EXAMPLE OF DOG-LEGGED CROSS-SECTION

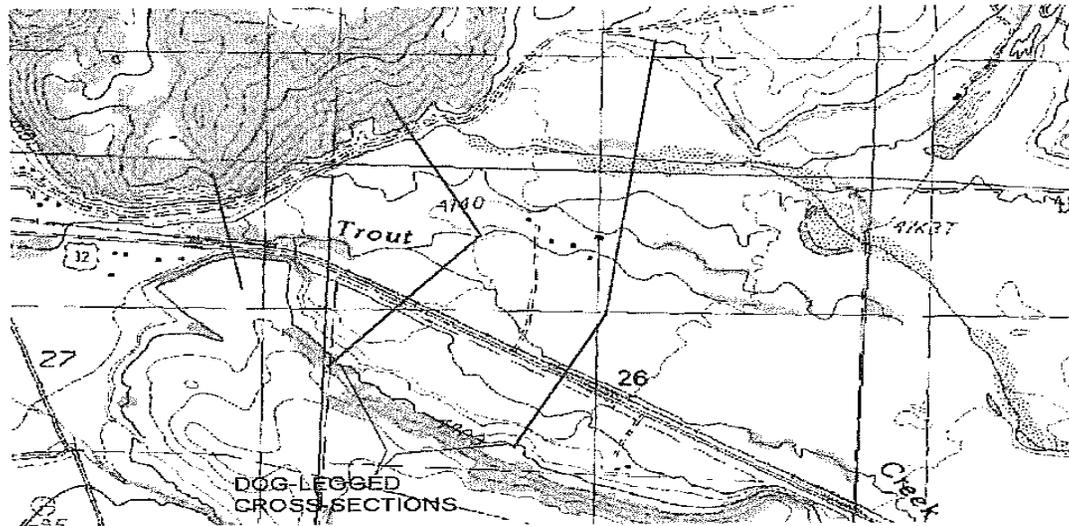
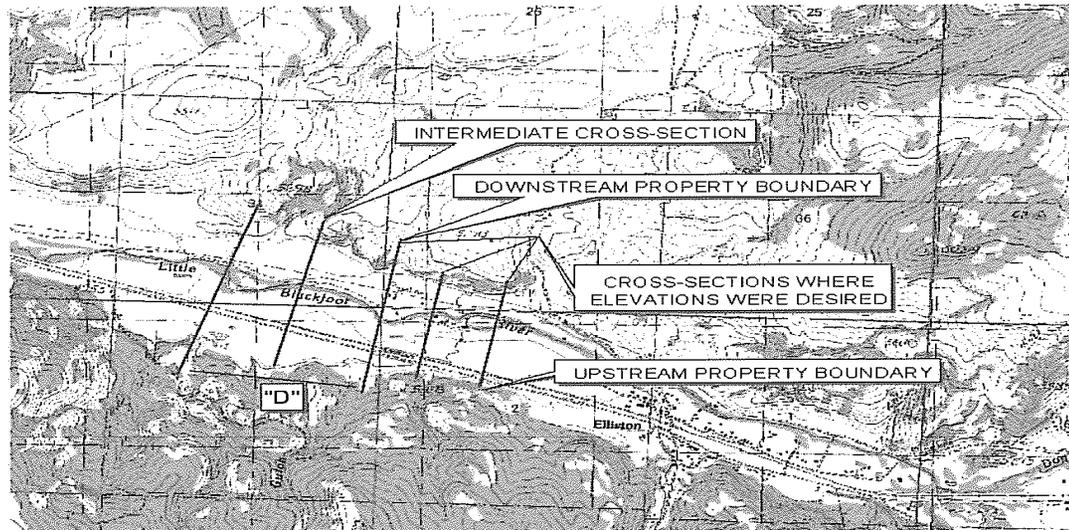


TABLE 1

Channel Slope (ft/ft) (As determined by the average water course slope from USGS quadrangle topographic maps)	Minimum Distance "D" (ft) from the downstream property boundary to the furthest downstream cross section (See Figure 2)
< 0.001	3000
0.001 - 0.0049	1500
0.005 - 0.01	500
> 0.01	100

FIGURE 2 - EXAMPLE OF CROSS SECTION LOCATIONS

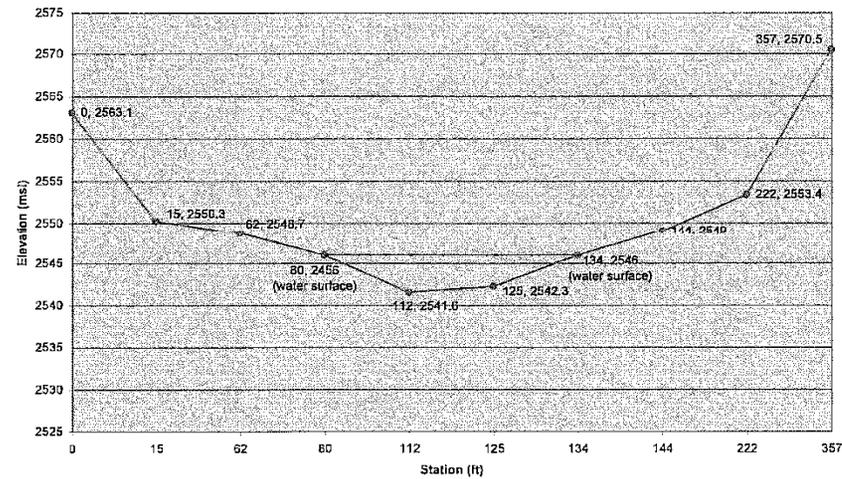


"D" - SEE TABLE 1

8. Cross-sections should be placed at representative locations throughout a floodplain reach and located in such a manner as to represent the flow reach in between cross sections. Each flow reach should be as uniform in geometry and roughness as practical. In addition, cross-sections are required at locations where changes occur in discharge, channel/floodplain slope, channel/floodplain shape, or channel/floodplain roughness; at locations where levees begin or end; and at bridges or control structures such as weirs. Several cross-sections should be used to describe areas where abrupt changes occur. Figure 3. illustrates the suggested cross sections locations for common types of changes in channel geometry.

TABLE 2			
Sample of Cross-Section Data			
Cross Section 2345			
(See Figure 4)			
Station	Elevation	Station	Elevation
(Left Side) 0	2563.1	125	2542.3
15	2550.3	134	2546.0 (w.s.)
62	2548.7	144	2549.0
80	2546.0 (w.s.)	222	2553.4
112	2541.6	(Right Side) 357	2570.5

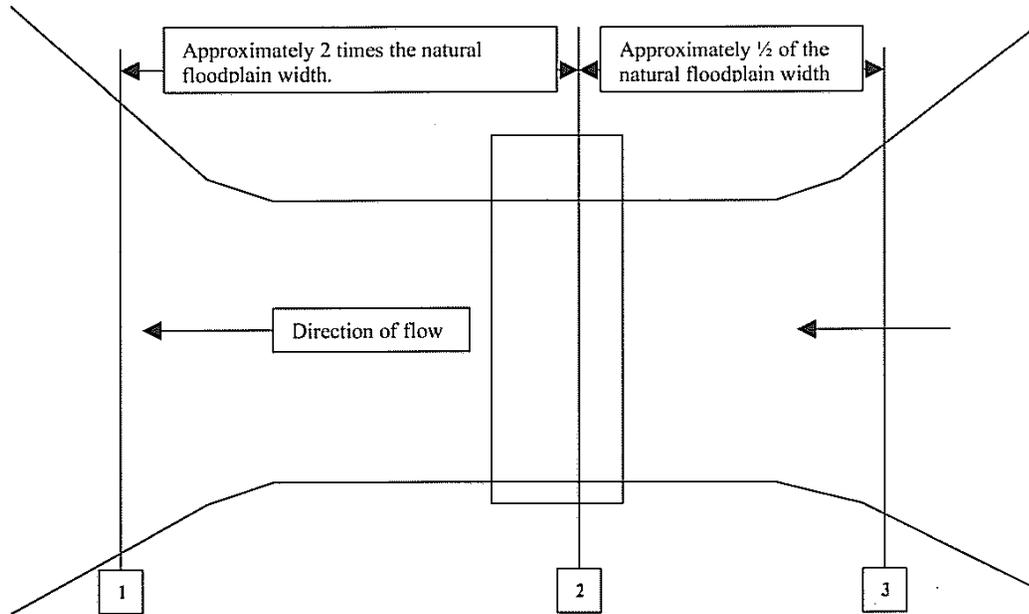
FIGURE 4
Cross Section 2345



References

FIGURE 3

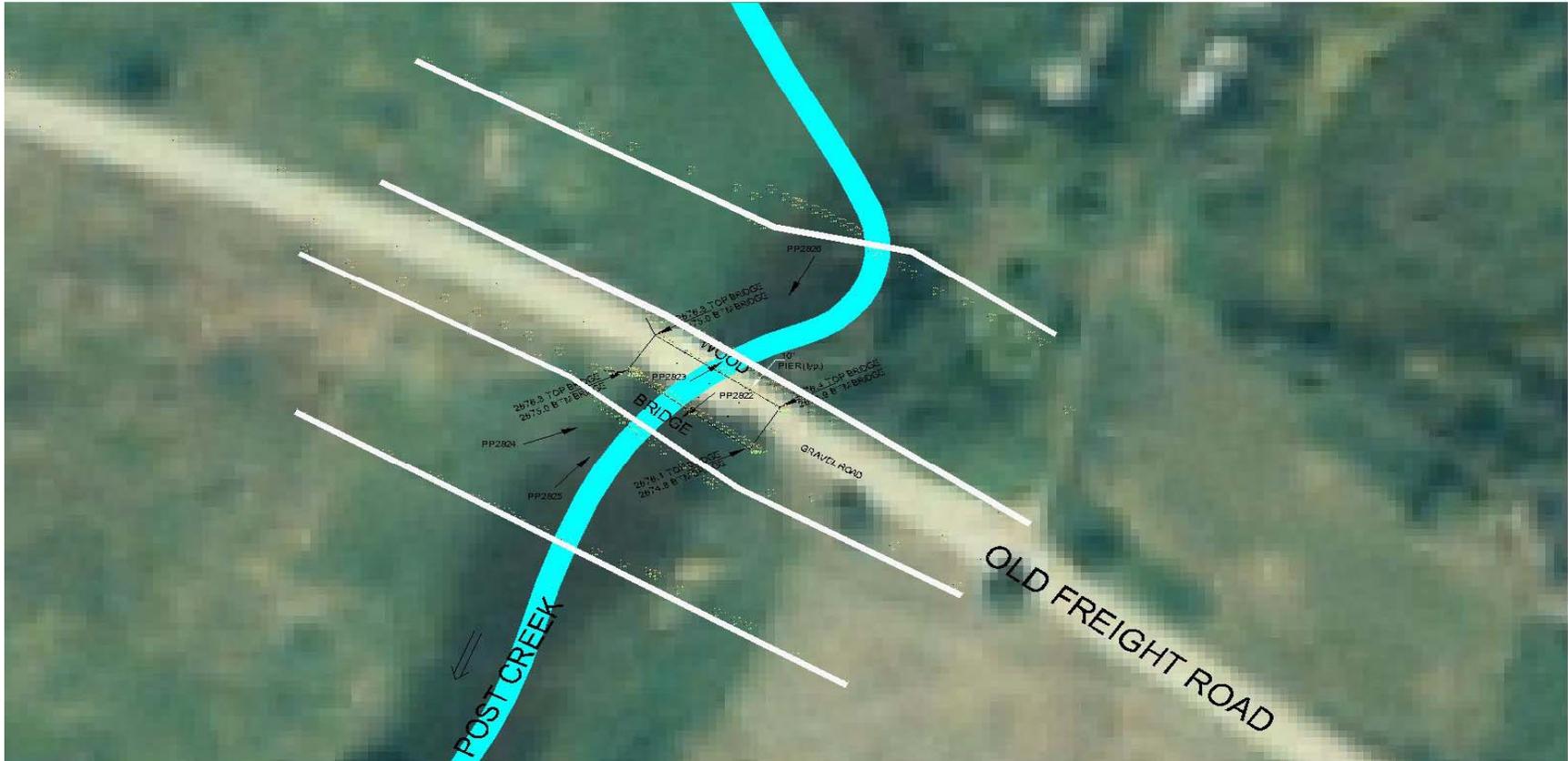
3A. Bridge Cross Sections





PHOTOS OF THE CROSS SECTION AREA

LOOKING AT EITHER SIDE OF CHANNEL



EXAMPLE STRUCTURE SURVEY