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MANNING'S "n" VALUE SELECTION REPORT
FOR
WAGNER WASH
FLOOD PLAIN DELINEATION STUDY
FCD Project 90-03

A343.014.001

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FOR

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

By

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PURPOSE

This report documents and summarizes the procedures used to select Manning's Roughness coefficients ("n" values) to be used as input parameters in the HEC-2 Water Surface Profile Model of Wagner Wash. This effort is prepared as one of the tasks identified in the Wagner Wash Floodplain Delineation Study, FCD Contract 90-03.

DISCUSSION

The proper selection of "n" values for natural open channels requires the application of considerable engineering judgment and experience as this single value represents a number of interdependent conditions. These include surface roughness, vegetation, channel irregularity, channel alignment, silting and scouring, obstruction, size and shape of channel, stage and discharge, seasonal change, suspended material and bed load.

Manning's "n" values were chosen as a result of both office and field investigations. The office procedures consisted of identifying through the use of topographic mapping and aerial photographs, such physical characteristics as channel slope, alignment, size and shape. Previously prepared hydraulic and hydrologic studies were reviewed as well as several "n" value selection manuals as listed in the references section of this report. The hydrologic analysis of Wagner Wash prepared by the Flood Control District used values ranging from 0.02 to 0.04 for purposes for flood routing. For the Hassayampa River Flood Insurance Study, "n" values used near river mile 21.1, the confluence with Wagner Wash, were 0.030 Channel longitudinal slope is about 0.5% for the entire reach except for the lowest 3 miles where the slope approaches 1.0%.

The primary reference source used to select "n" values was the preliminary draft of "Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona", U.S. Geological Survey, July, 1990.

The field investigation consisted of a single day long trip to the stream reach. The trip occurred on December 13, 1990. The investigation began at the downstream end of the reach at the confluence with the Hassayampa River, and proceeded upstream to the C.A.P. Photographs were taken at significant points along the reach and are included in this report.

LOCATION OF STUDY REACH

The Wagner Wash Study Reach begins at the confluence with the Hassayampa River at mile 21.1 and ends approximately 9 miles upstream at the C.A.P. overchute.

DESCRIPTION OF CHANNEL

Channel bed material from the confluence to mile 7.20 at Broken Tank is gravelly coarse sand. Banks are clearly defined, varying moderately and vegetated with a medium density of desert brush with occasional trees. Low flow areas of the channel bottom are clear. Higher portions

of the channel bottom also have a medium growth of brush and trees. Right and left overbank areas are natural, gently rolling desert areas with a light growth of brush.

From mile 7.20 to mile 8.30 above Broken Tank, the bed material changes from gravelly coarse sand to a clayey native soil as the channel becomes narrower, shallower and less well defined. Entire width of the channel in the reach has a medium density of desert brush and trees.

"n" Value Determination

$$n = n_b + n_1 + n_2 + n_3 + n_4$$

Where,

- n_b = Base Value of "n" for a straight uniform channel
- n_1 = Value for surface irregularities
- n_2 = Value for bends
- n_3 = Value for obstruction, and
- n_4 = Value for vegetation

Mile 0.00 to 0.35 - Channel

- $n_b = 0.024$
- $n_1 = 0.008$ Moderate irregularity
- $n_2 = 0.000$
- $n_3 = 0.002$ Minor obstruction
- $n_4 = \underline{0.005}$ Medium vegetation, trees along banks
0.039 Say 0.040

Mile 0.00 to 0.35 - Overbanks:

Light brush and trees, in summer. Trees, flow depth reaching branches, 0.065 (left) 0.100 (right).

Mile 0.35 to 5.88 - Channel

- $n_b = 0.024$
- $n_1 = 0.008$ Moderate irregularity
- $n_2 = 0.005$ Main Flow shifting occasionally from side to side
- $n_3 = 0.002$ Minor obstructions
- $n_4 = \underline{0.005}$ Sparse vegetation
0.044 Say 0.045

Mile 0.35 to 5.88 - Overbanks:

Light brush and trees, in summer. 0.065 (left and right).

Mile 5.88 to 7.20 - Channel

- $n_b = 0.024$
- $n_1 = 0.005$ Minor irregularity
- $n_2 = 0.005$ Main flow shifting occasionally from side to side
- $n_3 = 0.000$
- $n_4 = 0.025$ Dense brush along banks, small trees
0.059 Say 0.060

Mile 5.88 to 7.20 - Overbanks:

Light brush and trees, in summer. 0.065 (left and right)

Mile 7.20 to 8.30 - Channel

- $n_b = 0.031$
- $n_1 = 0.000$
- $n_2 = 0.000$
- $n_3 = 0.015$ Minor obstructions, logs, stumps, etc.
- $n_4 = 0.060$ Flow depth less than 1/2 of vegetation height, numerous trees, brush
0.106 Say 0.105

Mile 5.88 to 7.20 - Overbanks:

Light brush and trees, in summer, 0.065 (left and right)

SUMMARY

WAGNER WASH "n" VALUES

<u>River Miles</u>	<u>Left Overbank</u>	<u>Right Overbank</u>	<u>Channel</u>
0 - 0.35	0.065	0.100	0.040
0.35 - 5.88	0.065	0.065	0.045
5.88 - 7.20	0.065	0.065	0.060
7.20 - 8.30	0.065	0.065	0.105

PHOTOGRAPHS

12/13/90



Mile 0.18
Looking Upstream at
Channel and Right
Overbank



Looking Upstream at
Channel



Looking Upstream at
Channel and Left
Overbank



Looking Upstream at Channel. Note Bank on Right Side



Looking Upstream at Channel. Note Left Bank in Center of Photo.

Mile 1.40



Looking Upstream at Channel and Right Overbank



Looking Upstream at Channel and Left Overbank



Mile 2.2
Looking Upstream
at Left Overbank
Area



Looking Upstream
at Channel
Note Left Bank



Standing in Channel,
Looking Upstream at
Right Overbank

Mile 3.20



Looking Upstream Across Channel at Right Bank



Standing in Channel Looking at Left Overbank



Mile 4.1
Looking Downstream
at Left Overbank



Looking Downstream
at Channel. Area
on Right is with-
in Channel, Not
Overbank



Looking Downstream
at Right Overbank.

Mile 4.1



Panoramic View of Channel Looking Upstream at Crossing
with Sun Valley Parkway



Mile 4.1
Looking Upstream
at Left Overbank



Standing on Headwall,
Looking Upstream at
Channel



Looking Upstream at
Right Overbank



Mile 4.6
Looking Upstream
in Channel



Mile 5.5
Looking Downstream
in Channel



Looking Upstream
in Channel

Mile 6.2



Looking Upstream at Crossing with Sun Valley Parkway



Mile 6.3
Looking Upstream
at Left Overbank



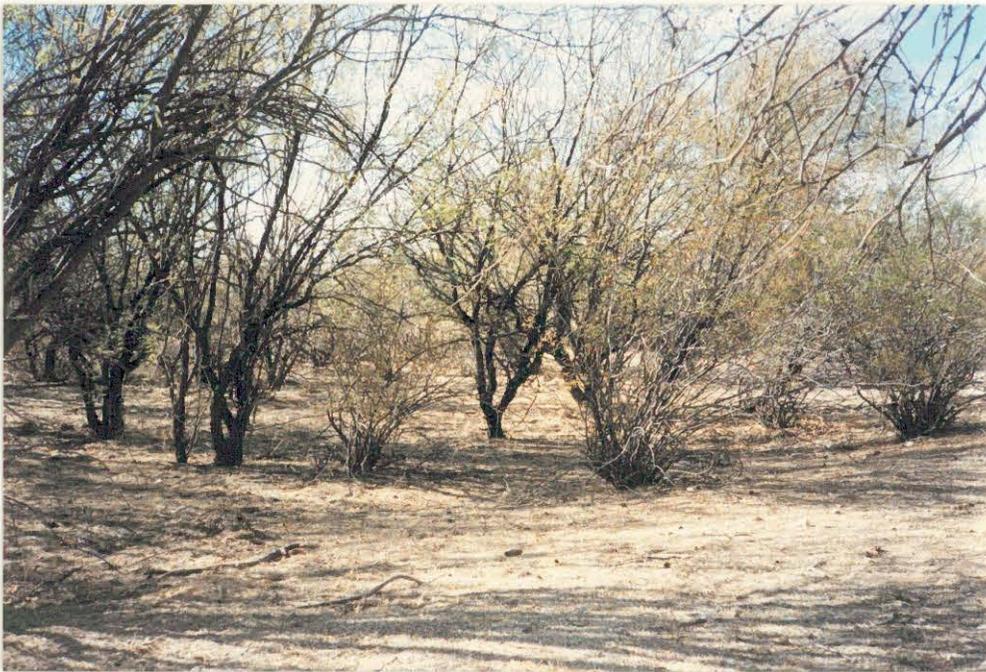
Looking Upstream
at Channel



Looking Upstream
at Right Overbank



Mile 7.3
Looking Downstream
at Channel



Looking Downstream
at Left Overbank

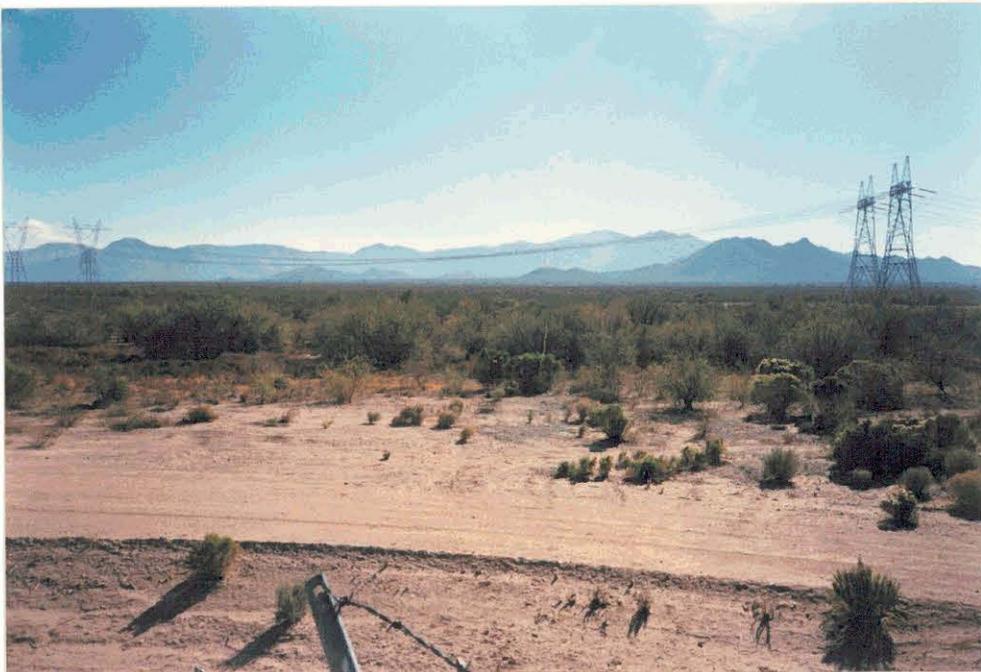


Looking Downstream
at Right Overbank

Mile 7.3
Looking Upstream
at Channel



Mile 8.3
Looking Downstream
Over Watershed
Area Standing on
top of CAP
Overchute



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