Final Manning's "n" Value Report for the FRS of Ocotillo Wash and Tributary-2 and FDS of Cave Creek Tributaries 2 and 3 within Cave Creek, Arizona

Prepared for:

Flood Control District of Maricopa County

Prepared by:

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1.0 INTRODUCTION

This report was prepared by HDR Engineering, Inc. in support of the detailed Floodplain Redelineation Study (FRS) for a portion of Ocotillo Wash and Ocotillo Wash Tributary-2, and approximate Floodplain Delineation Study (FDS) for Cave Creek Tributary 2, and Cave Creek Tributary 3. This report has been prepared under the Flood Control District of Maricopa County (FCDMC) contract FCD 2006C024, Work Assignment Number 2.

The Manning's "n" values from the Ocotillo Wash Floodplain Redelineation Study (HDR 2008) will be reviewed in comparison to the proposed n values at areas of adjacency within this work assignment. No changes will be made under this work assignment to the effective values of the previous study.

New Manning's "n" values will be developed in support of a portion of Ocotillo Wash and Ocotillo Wash Tributary-2, and Cave Creek Tributaries 2 and 3.

The "n" value assessments, prepared within this report, are approximately located as follows:

- The effective flood zone of Ocotillo Wash (FIS cross sections A through T)
- The effective Ocotillo Wash Tributary-2
- Two currently unmapped tributaries located within the Cave Creek Watershed, which are proposed as the Cave Creek Tributaries 2 and 3.

Refer to **Figure 1**, Location Map, and **Figure 2**, Vicinity Map, located following this section.

LOCATION MAP

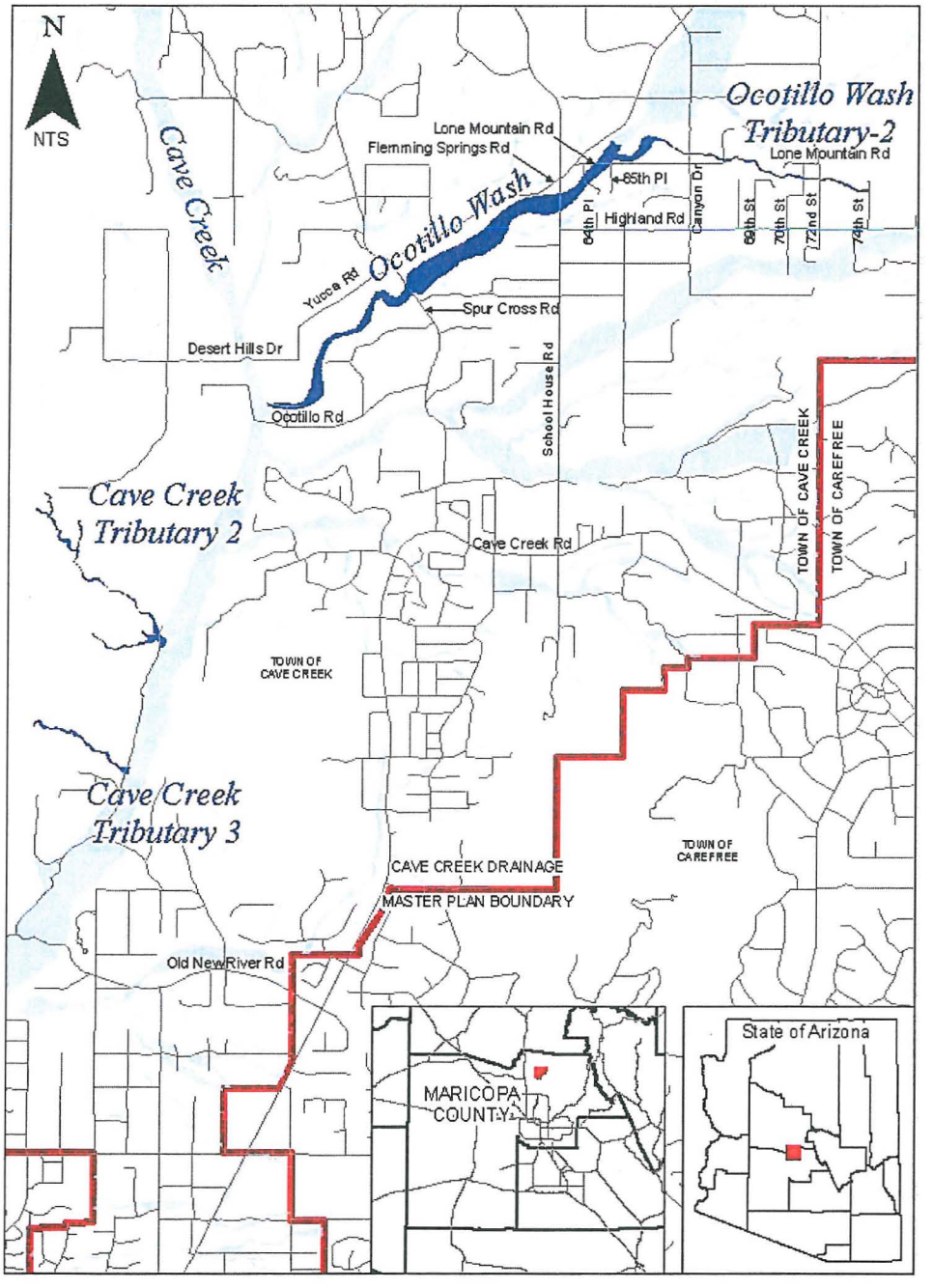


Figure 1

VICINITY MAP

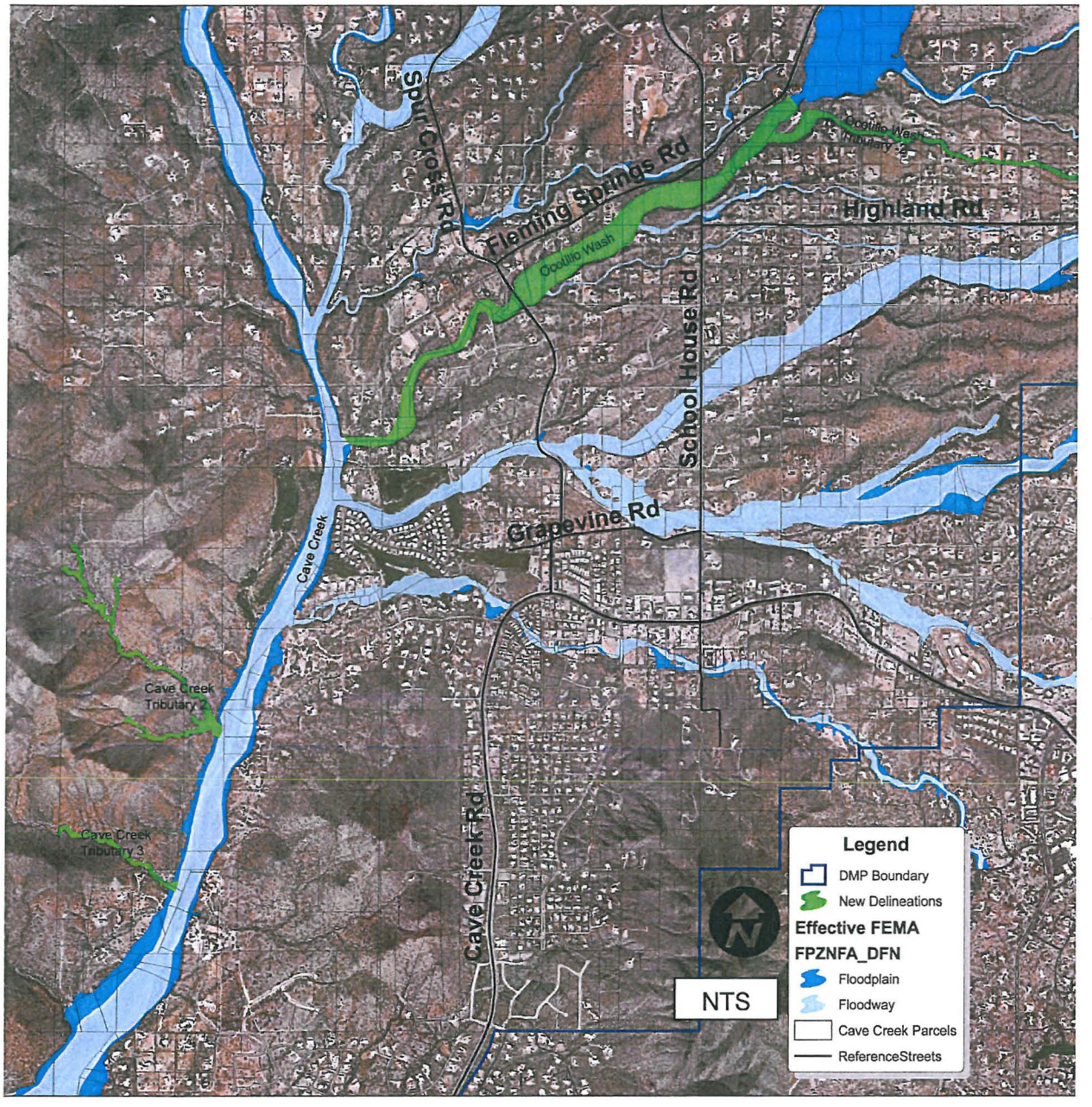


Figure 2

2.0 METHODOLOGY

The tributaries described above were examined for areas of similar roughness values. Manning's "n" values were assigned for the existing conditions as they related to each area of similar roughness for the 100-year storm event at the time of the study. The values were determined using the methodology outlined within the United States Geological Survey (USGS) report titled *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona* (Thomsen and Hjalmarson, 1991).

Several sources of data were utilized in the development of the "n" values presented within this report. Sources include Cave Creek ortho-rectified aerial photography (flight dates of November 3, 2007 and November 4, 2007, provided by the Flood Control District of Maricopa County), site surface photography, and site reconnaissance. Site surface photography and site reconnaissance were conducted on August 27, 2008. **Appendix A** contains the site reconnaissance photo logs.

The selected "n" values represent the most accurate roughness factors to ensure the energy losses due to friction are properly accounted for. The "n" values were computed by selecting an initial base "n_0" value which represents surface roughness of a straight, uniform channel composed of a known particular bed material. Channel materials and their respective roughness coefficients can vary from the main channel section and within each of the over banks. Additional factors contributing to the increase of the roughness coefficient include vegetation, channel slope, channel irregularity, obstructions, and a degree of meandering. Each component affects the roughness coefficient with an incremental addition to the base "n_0".

The components of the "n" value equation are computed by:

$$n = (n_0 + n_1 + n_2 + n_3 + n_4)\ m$$

Where

n_0 = base value of n for a straight uniform channel

n_1= value for surface irregularities

n_2= value for obstruction

n_3 = value of vegetation

n_4 = variations in channel cross sections, and

m = degree of meandering

The major adjustments to the base values of "n" utilized within this report are further described in Section 4.0.

3.0 BASE "N" VALUE DETERMINATION

The base "n_0" values utilized within this analysis were selected as average condition within the portions of the wash tributaries with similar characteristics, rather than selecting the smoothest reach possible of existing bed material within each tributary. The bed materials representative of each of the tributaries may vary from fine grain sand to boulders, as described in the report titled *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona.* **Table 3.1** illustrates the base "n" value range for each of the study washes and their tributaries.

Table 3.1: Base "n_0" Value

Wash	Site	Base "n_0" Range		
		Left Overbank	Main Channel	Right Overbank
Ocotillo Wash, Tributary-2	101-110	0.028-0.028	0.028-0.050	0.028-0.028
Ocotillo Wash	111-136	0.028-0.040	0.025-0.028	0.024-0.028
Cave Creek, Tributary 2	201-221	0.025-0.028	0.024-0.035	0.025-0.028
Cave Creek, Tributary 3	301-308	0.025-0.030	0.025-0.035	0.025-0.028

4.0 ADJUSTMENTS TO THE BASE VALUE

Major adjustments to the base "n_0" were utilized to account for cross-section characteristics. Minor adjustments for the reach characteristics between cross-sections, which may include changes of size, shape, and shifts in the direction of flow, have not been included as part of this report.

Changes to the base "n_0" consist of adjustment factors specific to the cross-section which are further described as the degree of channel irregularity (n_1), effects of obstructions (n_2), vegetation (n_3) and variations in the channel cross-sections (n_4). Based on this general procedure, the incremental adjustments n_1 through n_4 are added to the base "n_0" resulting in an increased roughness value. The resultant of the base "n_0" and the corresponding adjustment factors n_1 through n_4 is then multiplied by the degree of meandering (m), to produce a final "n" value representative of the specific grouping. Refer to **Appendix B, C, D, and E** for computations of the Manning Roughness Factor for each wash and their tributaries.

5.0 DETAILED ANALYSIS

Determination of the Manning's Roughness coefficient adjustments factors and their level of impact within each tributary yielded differing results. Portions of the tributaries with similar bed material were evaluated separately to determine the final "n" value for the main channel, left overbank and right overbank. **Table 5.1** illustrates the range for the final roughness coefficient along each wash and their tributaries.

Table 5.1: Manning's "n" Value

Wash	Site	Manning's "n" Range		
		Left Overbank	Main Channel	Right Overbank
Ocotillo Wash, Tributary-2	101-110	0.041-0.088	0.039-0.086	0.041-0.081
Ocotillo Wash	111-136	0.048-0.080	0.040-0.055	0.044-0.070
Cave Creek, Tributary 2	201-221	0.053-0.072	0.041-0.069	0.053-0.069
Cave Creek, Tributary 3	301-308	0.058-0.070	0.048-0.062	0.058-0.065

6.0 REFERENCES

Thomsen, B.W. and Hjalmarson, H.W., (April 1991), Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. Flood Control District of Maricopa County, Arizona, Report, Page 126.

HDR Engineering, Inc, Cave Creek Drainage Master Plan, Technical Data Notebook Ocotillo Wash Floodplain Redelineation, Cave Creek, Arizona, November 28, 2008.

APPENDIX A SITE RECONNAISSANCE PHOTOGRAPHY LOG

Site 99 – Photo Number 1

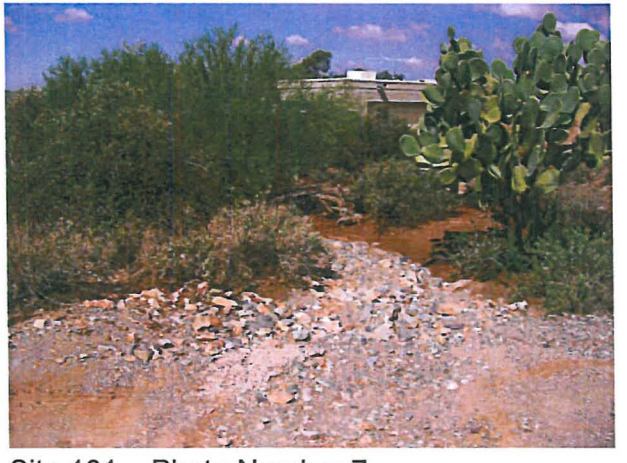
Site 99 – Photo Number 2

Site 99 – Photo Number 3

Site 99 – Photo Number 4

Site 99 – Photo Number 5

Site 101 – Photo Number 6



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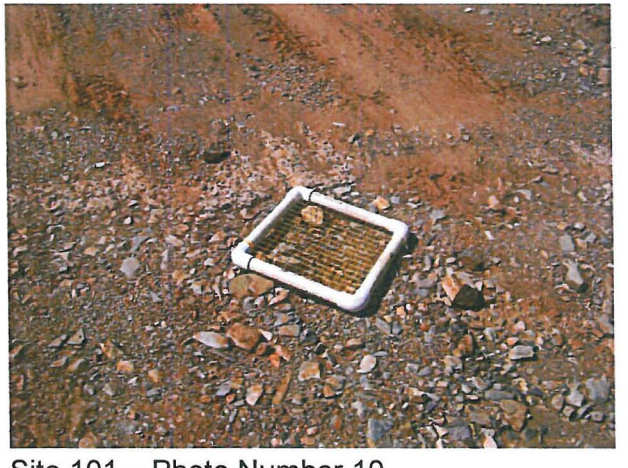

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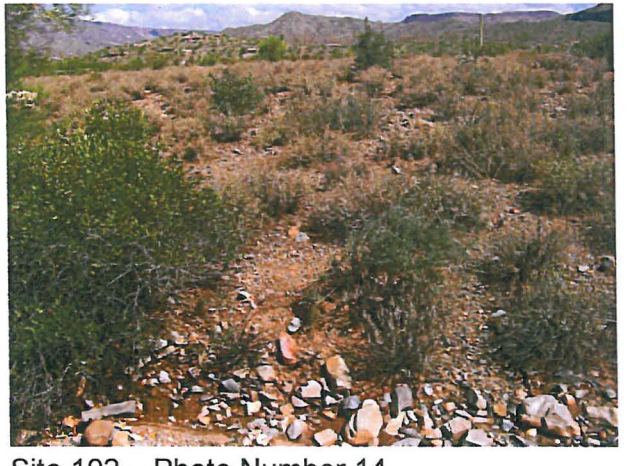
Site 102 – Photo Number 13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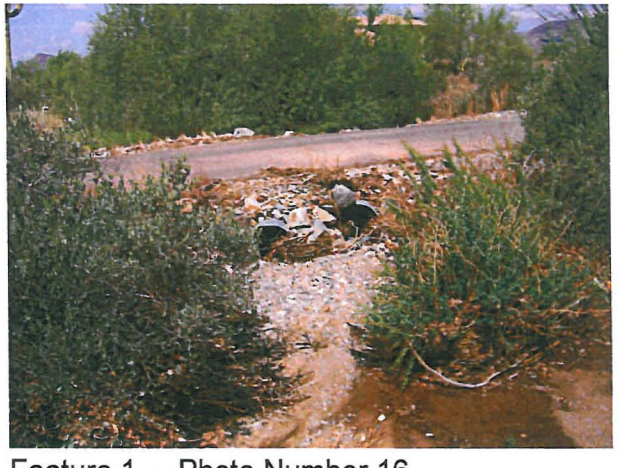
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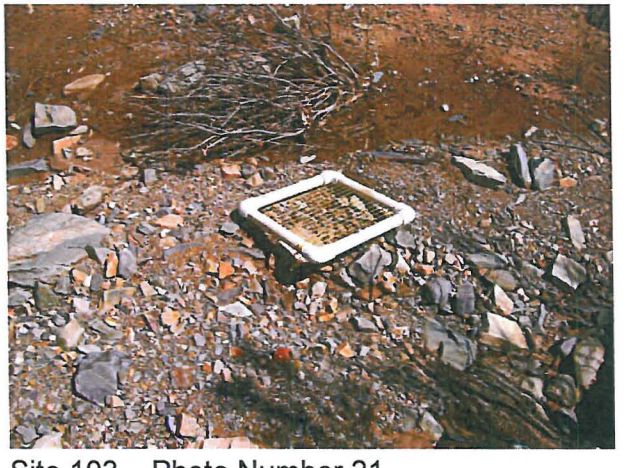
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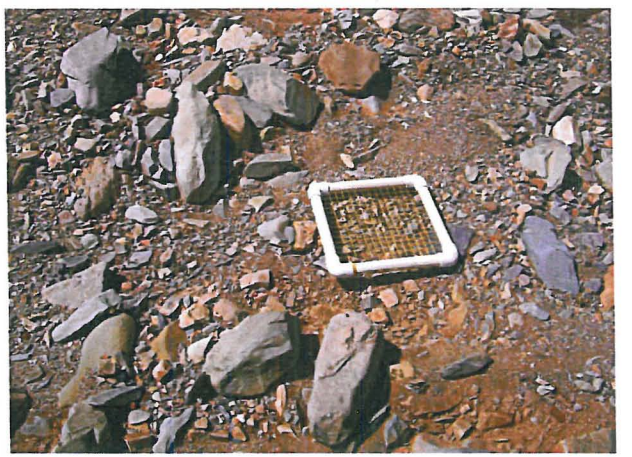
Site 104 – Photo Number 29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Site 106 – Photo Number 38

Feature 7 – Photo Number 39

Feature 8 – Photo Number 40

Feature 9 – Photo Number 41

Feature 10 – Photo Number 42

Site 107 – Photo Number 43

Site 108 – Photo Number 44

Site 108 – Photo Number 45

Site 108 – Photo Number 46

Site 108 – Photo Number 47

Site 109 – Photo Number 48

Site 109 – Photo Number 49

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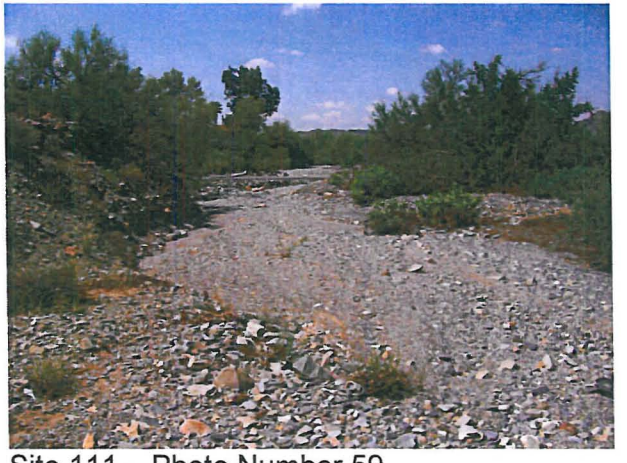
Site 110 – Photo Number 57

Site 111 – Photo Number 58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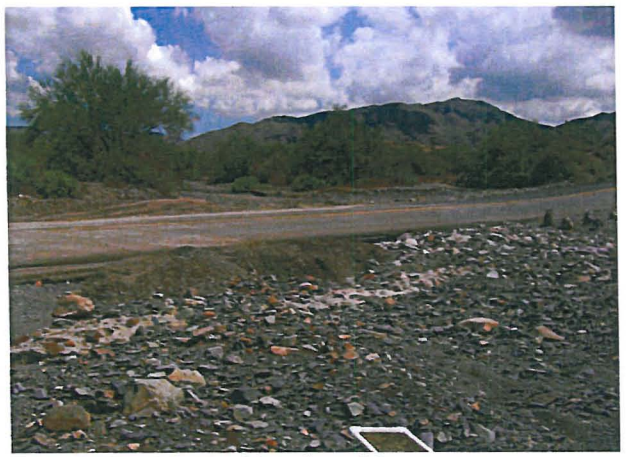
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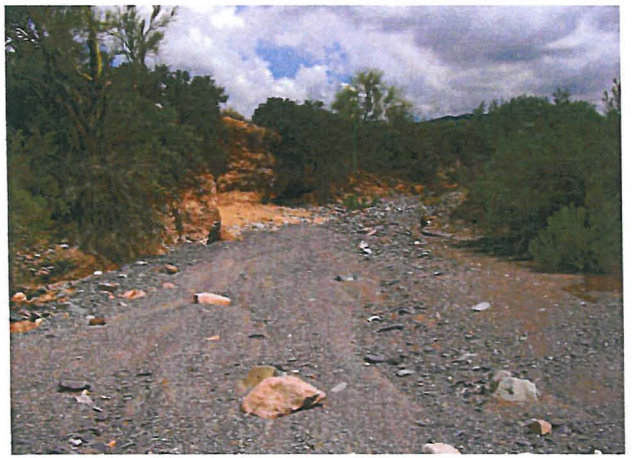
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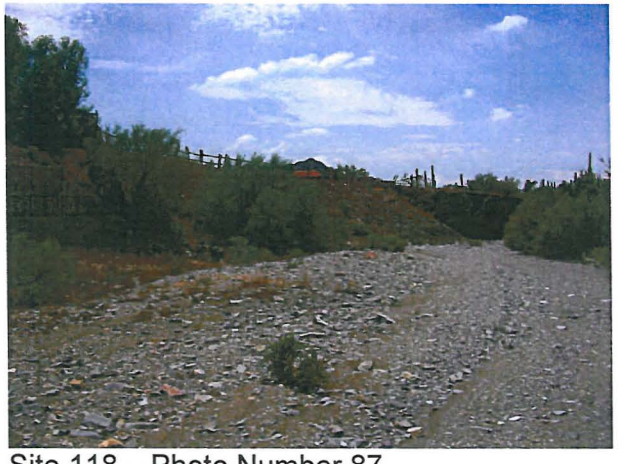
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Site 122 – Photo Number 94

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Site 122 – Photo Number 96

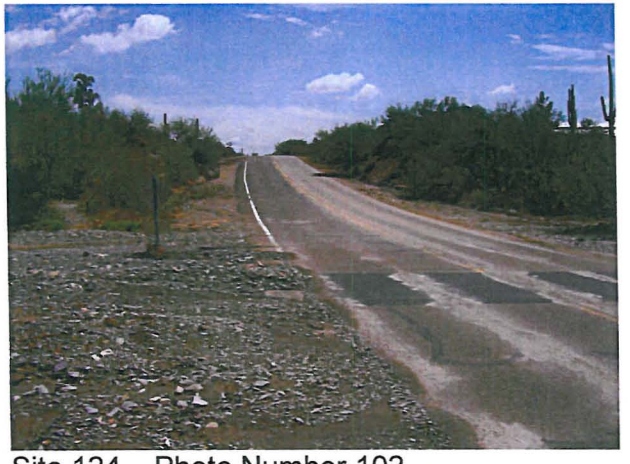
Site 122 – Photo Number 97

Site 123 – Photo Number 98

Site 123 – Photo Number 99

Site 124 – Photo Number 100

Site 124 – Photo Number 101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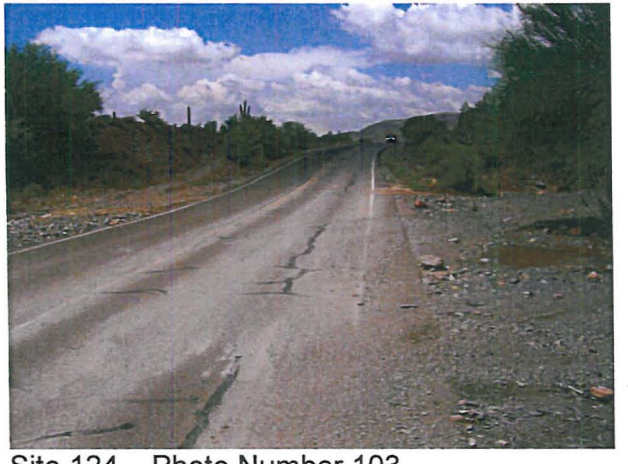
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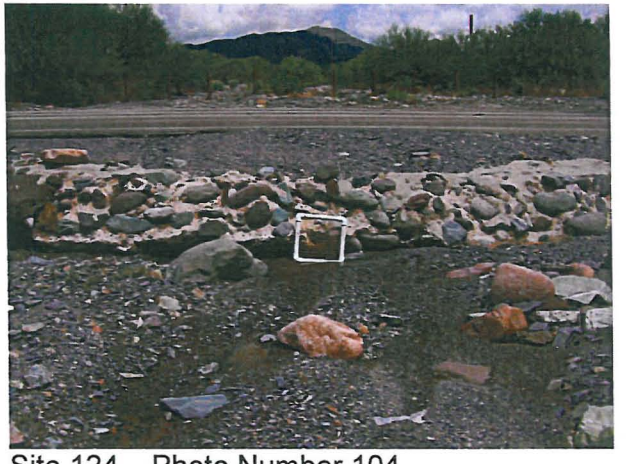
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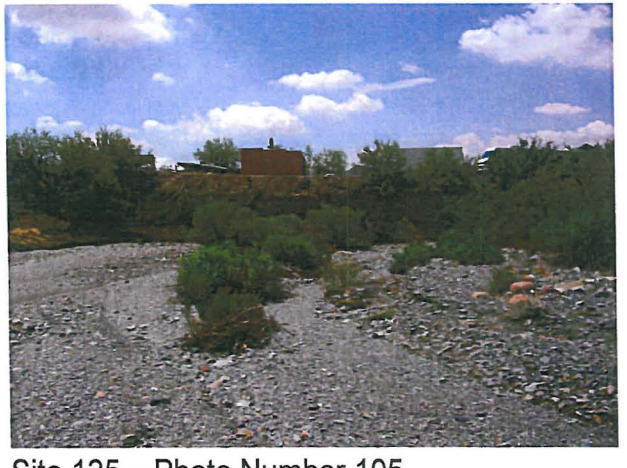
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Site 128 – Photo Number 113

Site 129 – Photo Number 114

Site 129 – Photo Number 115

Site 129 – Photo Number 116

Site 129 – Photo Number 117

Site 129 – Photo Number 118

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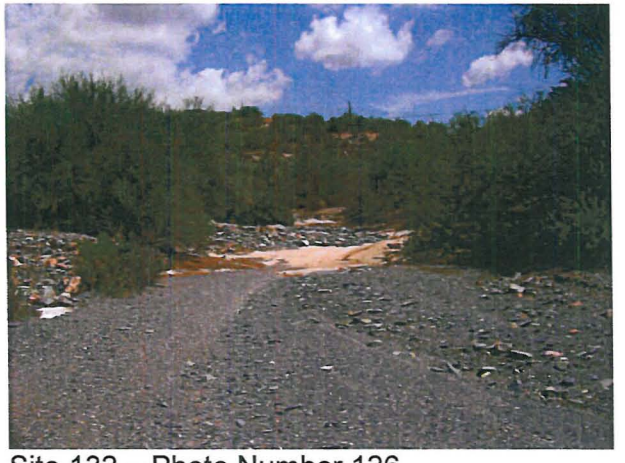
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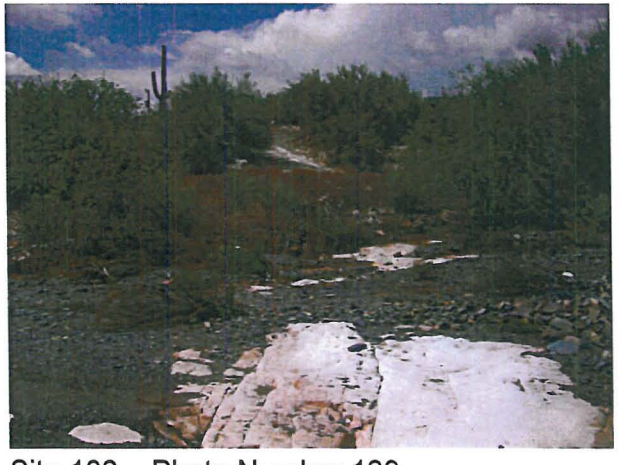
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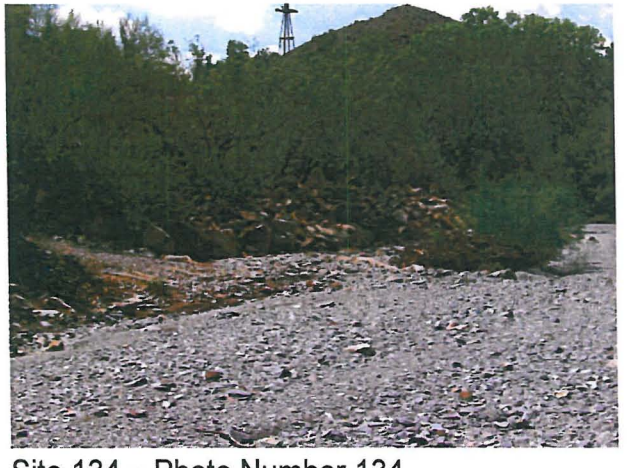
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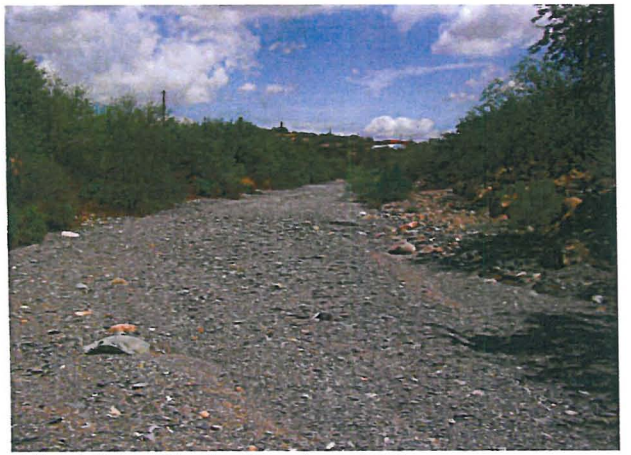
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Site 204 – Photo Number 5

Site 205 – Photo Number 6

Site 205 – Photo Number 7

Site 206 – Photo Number 8

Site 206 – Photo Number 9

Site 206 – Photo Number 10

Site 207 – Photo Number 11

Site 208 – Photo Number 12

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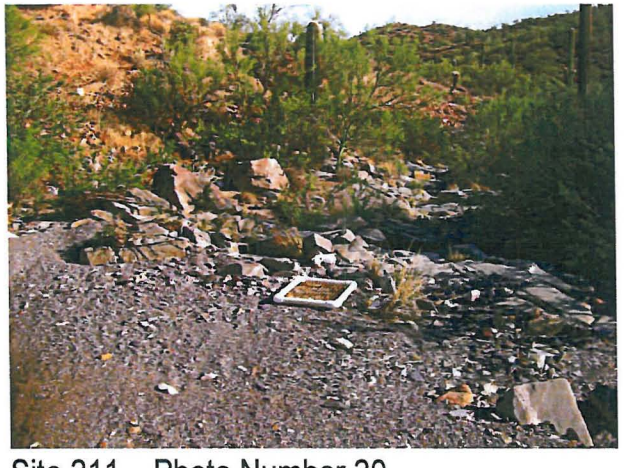
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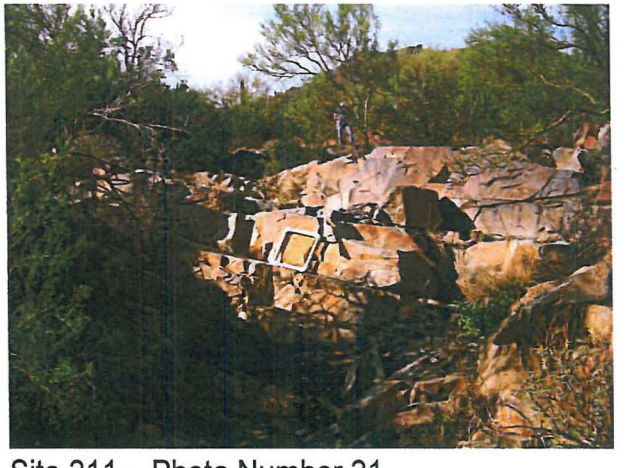
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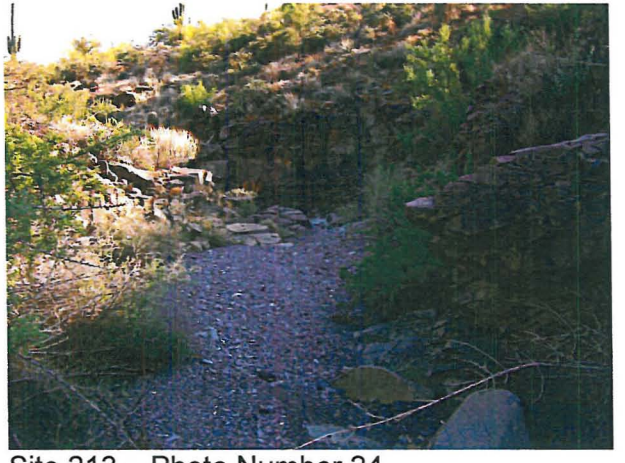
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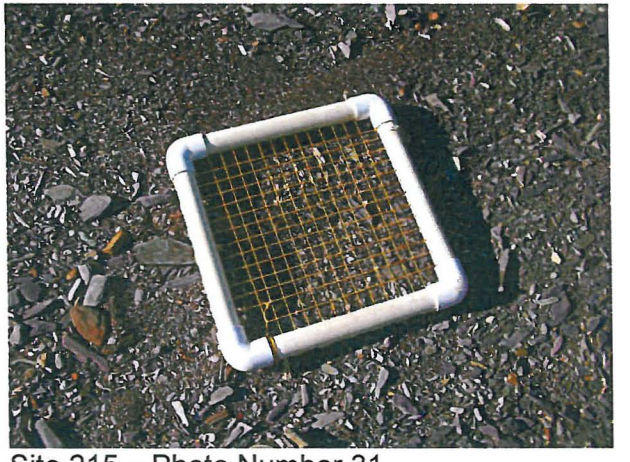
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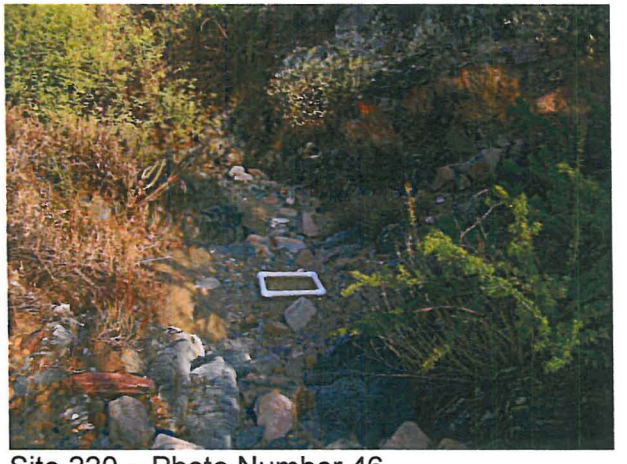
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Site 301 – Photo Number 2

Site 301 – Photo Number 3

Site 301 – Photo Number 4

Site 301 – Photo Number 5

Site 302 – Photo Number 6

Site 302 – Photo Number 7

Site 302 – Photo Number 8

Site 303 – Photo Number 9

Site 303 – Photo Number 10

Site 303 – Photo Number 11

Site 303 – Photo Number 12

Site 303 – Photo Number 13

Site 304 – Photo Number 14

Site 305 – Photo Number 15

Site 305 – Photo Number 16

Site 306 – Photo Number 17

Site 306 – Photo Number 18

Site 306 – Photo Number 19

Site 307 – Photo Number 20

Site 308 – Photo Number 21

Site 308 – Photo Number 22

Site 308 – Photo Number 23

APPENDIX B MANNING'S "n" VALUE DETERMINATION FOR OCOTILLO WASH

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3584-3588
Section Description:	Site 111

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			0.024
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010		0.010	0.008
	Severe		0.011 - 0.020	0.015		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.010	
	Medium		0.010 - 0.025	0.010		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.058**	**0.053**	**0.052**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3589-3593
Section Description:	Site 112

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			0.024
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.010	
	Medium		0.010 - 0.025	0.010		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.048**	**0.049**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3594
Section Description:	Site 113

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			0.024
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.040**	**0.044**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3595-3597
Section Description:	Site 114

AT ROAD

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.048**	**0.040**	**0.048**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3598-3602
Section Description:	Site 115

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.048**	**0.040**	**0.048**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3603-3605
Section Description:	Site 116

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			0.024
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			0.015
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.040**	**0.059**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3606-3610
Section Description:	Site 117

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.040**	**0.058**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3611-3614
Section Description:	Site 118

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.068**	**0.040**	**0.053**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3615
Section Description:	Site 119

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030		0.002	
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			0.010
	Medium		0.010 - 0.025	0.015	0.020	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.053	0.055	0.048

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3616
Section Description:	Site 120

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.058	0.040	0.053

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3617,3618
Section Description:	Site 121

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	
	Medium		0.010 - 0.025			0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.040**	**0.053**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3619-3623
Section Description:	Site 122

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	
	Medium		0.010 - 0.025			0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.040**	**0.053**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3624,3625
Section Description:	Site 123

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.040**	**0.053**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3626,3630
Section Description:	Site 124

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.048**	**0.040**	**0.048**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3631
Section Description:	Site 125

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	
	Medium		0.010 - 0.025			0.012
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.072**	**0.046**	**0.058**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3632
Section Description:	Site 126

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	0.010
	Medium		0.010 - 0.025	0.012		
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.075	0.046	0.055

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3633-3637
Section Description:	Site 127

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			0.018
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	0.010
	Medium		0.010 - 0.025	0.012		
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.046**	**0.070**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3638,3639
Section Description:	Site 128

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010			0.010
	Severe		0.011 - 0.020	0.015		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	0.010
	Medium		0.010 - 0.025	0.012		
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.069**	**0.046**	**0.061**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3640-3644
Section Description:	Site 129

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			0.018
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	0.010
	Medium		0.010 - 0.025	0.012		
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.055	0.040	0.061

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3645
Section Description:	Site 130

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.008		
	Severe		0.011 - 0.020			0.014
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	0.010
	Medium		0.010 - 0.025	0.012		
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.040**	**0.057**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3646-3650
Section Description:	Site 131

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.008		0.008
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.051**	**0.040**	**0.051**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3651-3656
Section Description:	Site 132

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025		0.025	
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.008	0.010	0.008
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.051**	**0.042**	**0.051**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3657,3658
Section Description:	Site 133

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025		0.025	
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005		0.005
	Moderate		0.006 - 0.010		0.010	
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.048**	**0.042**	**0.048**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3659,3660
Section Description:	Site 134

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028		0.028	0.028
	Cobble		0.030 - 0.050	0.040		
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005		0.005
	Moderate		0.006 - 0.010		0.010	
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010	0.002	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.060**	**0.045**	**0.048**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3661-3666
Section Description:	Site 135

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028		0.028	0.028
	Cobble		0.030 - 0.050	0.040		
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	0.005
	Moderate		0.006 - 0.010	0.010		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.025		0.025
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.080**	**0.040**	**0.063**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Ocotillo Wash
Photograph No:	3667-3669
Section Description:	Site 136

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.025		0.025
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.040**	**0.063**

APPENDIX C MANNING'S "n" VALUE DETERMINATION FOR OCOTILLO WASH TRIBUTARY-2

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: FRS Ocotillo Wash & Tributary-2
Stream: Tributary-2
Photograph No: 3527-3531
Section Description: Site 99
Naturally Occurring Lateral Weir #6

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.001	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.005
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.051**	**0.039**	**0.041**

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3532-3536
Section Description:	Site 101

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.020	0.010	0.025
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.064	0.066

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3537-3541
Section Description:	Site 102

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.050	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.056**	**0.086**	**0.056**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3543-3547
Section Description:	Site 103

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.020	0.010	0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.061**	**0.064**	**0.061**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3352-3556
Section Description:	Site 104

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.020	0.010	0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.064	0.061

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3357-3559
Section Description:	Site 105

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003		0.003
	Moderate		0.006 - 0.010		0.006	
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.022	0.010	0.018
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000		0.000
	Alternating (occasionally)		0.001 - 0.005		0.001	
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000		1.000
	Appreciable		1.15		1.120	
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.063**	**0.069**	**0.059**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3560-3564
Section Description:	Site 106

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.010	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.056**	**0.056**	**0.056**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3569
Section Description:	Site 107

Note: Habitable structure

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024		0.028	
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.002	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.035	0.020	0.030
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.022		0.020
	Large		0.025 - 0.050		0.025	
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.088**	**0.083**	**0.081**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3570-3573
Section Description:	Site 108

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.010	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.100	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.056**	**0.058**	**0.056**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3574-3578
Section Description:	Site 109

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.005		0.005
	Medium		0.010 - 0.025		0.010	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.120	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.041**	**0.054**	**0.041**

Project:	FRS Ocotillo Wash & Tributary-2
Stream:	Tributary-2
Photograph No:	3579-3583
Section Description:	Site 110

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.003	0.003	0.003
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.010		0.010
	Medium		0.010 - 0.025		0.010	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.120	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.051**	**0.059**	**0.051**

APPENDIX D MANNING'S "n" VALUE DETERMINATION FOR CAVE CREEK TRIBUTARY 2

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3678
Section Description:	Site 201

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.061**	**0.046**	**0.061**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3679
Section Description:	Site 202

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.046	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3680,3681
Section Description:	Site 203

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.046	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3682
Section Description:	Site 204

Note main channel bed reduced to account for fine material, obstructions and irregularity raised to account for cobbles

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024		0.024	
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.051	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3683,3684
Section Description:	Site 205

Note main channel bed reduced to account for fine material, obstructions and irregularity raised to account for cobbles

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.049	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3685-3687
Section Description:	Site 206

Note main channel bed reduced to account for fine material, obstructions and irregularity raised to account for cobbles

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.008		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.059	0.052	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3688
Section Description:	Site 207

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.032	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020		0.015	
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.066	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3689
Section Description:	Site 208

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025		0.025	
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.015	0.020	0.015
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.067**	**0.063**	**0.067**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3690-3693
Section Description:	Site 209

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024		0.024	
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.008	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.048	0.061

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3694-3696
Section Description:	Site 210

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	
	Severe		0.011 - 0.020			0.012
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.004	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.061	0.062	0.063

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3697,3698
Section Description:	Site 211

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025		0.025	
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.012	0.020	0.012
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.067**	**0.069**	**0.067**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3699
Section Description:	Site 212

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.005		0.005
	Severe		0.011 - 0.020		0.008	
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.015	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.061**	**0.064**	**0.061**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3700-3703
Section Description:	Site 213

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025	0.025		0.025
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024		0.024	
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.020	0.012	0.012
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.072**	**0.059**	**0.063**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3704,3705
Section Description:	Site 214

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025		0.025	
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.005		0.005
	Severe		0.011 - 0.020		0.008	
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.010
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.059**	**0.055**	**0.067**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3706-3708
Section Description:	Site 215

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.005		0.005
	Severe		0.011 - 0.020		0.008	
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.015	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	0.059	0.064	0.059

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3709,3710
Section Description:	Site 216

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025	0.025	0.025	0.025
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.005	0.005	0.005
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.012	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.058**	**0.054**	**0.058**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3711-3713
Section Description:	Site 217

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.053**	**0.046**	**0.053**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3717-3721
Section Description:	Site 218

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.008	0.008	0.008
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.064**	**0.059**	**0.064**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3722-3724
Section Description:	Site 219

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.012	0.015	0.012
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.069**	**0.067**	**0.069**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3714-3716, 3725,3726
Section Description:	Site 220

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.059**	**0.046**	**0.059**

Project:	FDS Cave Creek Tributary 2
Stream:	Cave Creek Tributary 2
Photograph No:	3727-3729
Section Description:	Site 221

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024		0.024	
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.005	
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.002	
	Minor		0.005 - 0.015	0.005		0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.008	0.005	0.008
	Medium		0.010 - 0.025			
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00			
	Appreciable		1.15	1.150	1.150	1.150
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.059**	**0.041**	**0.059**

APPENDIX E MANNING'S "n" VALUE DETERMINATION FOR CAVE CREEK TRIBUTARY 3

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3730-3734
Section Description:	Site 301

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.008	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.058**	**0.051**	**0.058**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3737-3739
Section Description:	Site 302

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			0.025
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.030	0.035	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	
	Severe		0.011 - 0.020			0.020
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.010	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.060**	**0.060**	**0.065**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3740-3744
Section Description:	Site 303

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028		0.028	0.028
	Cobble		0.030 - 0.050	0.030		
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010		0.010	
	Severe		0.011 - 0.020	0.018		0.015
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.012	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.070**	**0.055**	**0.065**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3745
Section Description:	Site 304

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025	0.025	0.025	0.025
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020	0.018	0.020	0.018
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.012	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.065**	**0.062**	**0.065**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3746,3747
Section Description:	Site 305

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.015	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.060**	**0.060**	**0.060**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3748-3750
Section Description:	Site 306

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028		0.028
	Cobble		0.030 - 0.050		0.030	
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010		0.010	0.010
	Severe		0.011 - 0.020	0.012		
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.005	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.062**	**0.050**	**0.060**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3751
Section Description:	Site 307

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010		0.010
	Severe		0.011 - 0.020		0.018	
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.012	0.005	0.012
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.060**	**0.056**	**0.060**

Project:	FDS Cave Creek Tributary 3
Stream:	Cave Creek Tributary 3
Photograph No:	3752-3754
Section Description:	Site 308

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degre of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.010	0.010	0.010
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.005	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
n = (n0 + n1 + n2 + n3 + n4) m						
			USE:	**0.058**	**0.048**	**0.058**

APPENDIX F MANNING'S "n" VALUE DETERMINATION EXHIBITS

Legend

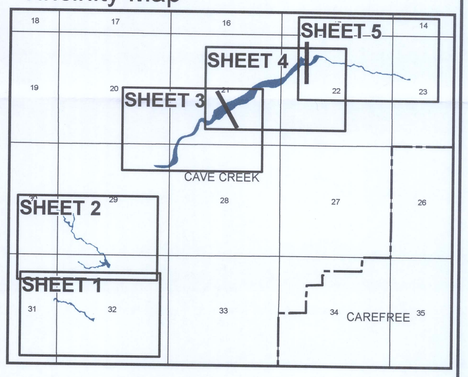
- 112 PHOTOGRAPHIC LOCATIONS
- 65 PHOTO DIRECTION/NUMBER
- MANNING'S n VALUE BOUNDARY
- STREAM
- STREET ALIGNMENTS
- 31 SECTION LINES

CONTOURS-1254

- Index
- Intermediate

Site	Left Overbank	Main Channel	Right Overbank
Site 301	0.058	0.051	0.058
Site 302	0.060	0.060	0.065
Site 303	0.070	0.055	0.065
Site 304	0.065	0.062	0.065
Site 305	0.060	0.060	0.060
Site 306	0.062	0.050	0.060
Site 307	0.060	0.056	0.060
Site 308	0.058	0.048	0.058

Vincinity Map



SITE FIELD DATA AND PHOTOGRAPHS COLLECTED ON AUGUST 27, 2008.

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCUARACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY.
FLIGHT DATES: November 2007

PHOTO LOCATIONS AND MANNING'S "n" VALUE SITES FOR CAVE CREEK TRIBUTARY 3

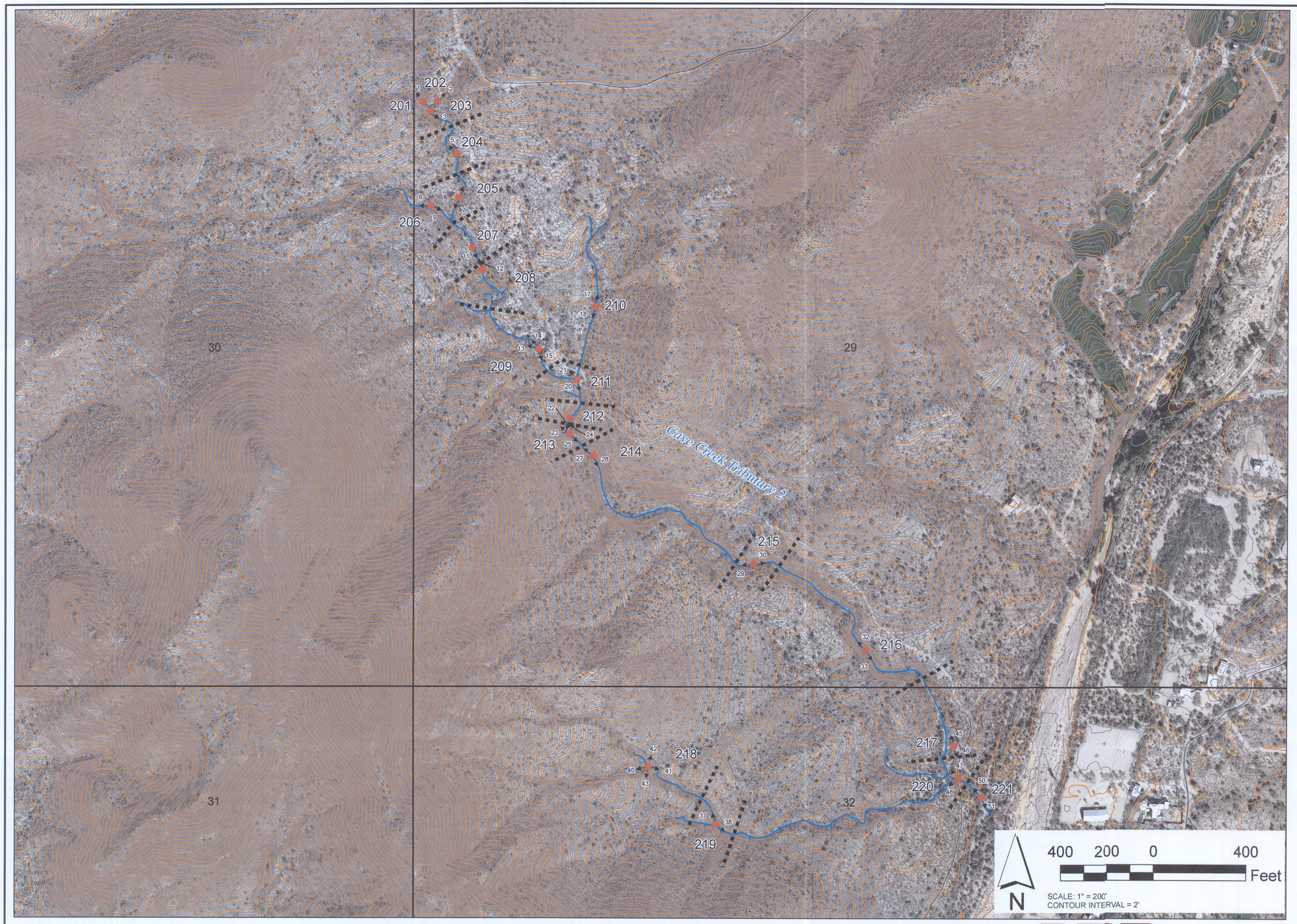
Flood Control District of Maricopa County

HDR

3200 EAST CAMELBACK ROAD, SUITE 350
PHOENIX, AZ 85018-2311
(602) 522-7700

FLOODPLAIN REDELINEATION STUDY OF OCOTILLO WASH AND TRIBUTARY-2, AND FLOODPLAIN DELINEATION STUDY OF CAVE CREEK TRIBUTARES 2 AND 3.
Project Contract Number: FCD2006C024
Work Assignement No. 2
HDR Project Number: 91427

OCTOBER 22, 2008



Legend

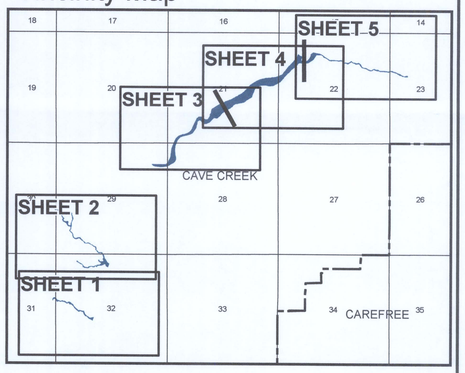
- 112 PHOTOGRAPHIC LOCATIONS
- 65 PHOTO DIRECTION/NUMBER
- MANNING'S n VALUE BOUNDARY
- STREAMS
- STREET ALIGNMENTS
- 31 SECTION LINES

CONTOURS-1254

- Index
- Intermediate

Site	Left Overbank	Main Channel	Right Overbank
Site 201	0.061	0.046	0.061
Site 202	0.061	0.046	0.061
Site 203	0.061	0.046	0.061
Site 204	0.061	0.051	0.061
Site 205	0.061	0.049	0.061
Site 206	0.059	0.052	0.061
Site 207	0.061	0.066	0.061
Site 208	0.067	0.063	0.067
Site 209	0.061	0.048	0.061
Site 210	0.061	0.062	0.063
Site 211	0.067	0.069	0.067
Site 212	0.061	0.064	0.061
Site 213	0.072	0.059	0.063
Site 214	0.059	0.055	0.067
Site 215	0.059	0.064	0.059
Site 216	0.058	0.054	0.058
Site 217	0.053	0.046	0.053
Site 218	0.064	0.059	0.064
Site 219	0.069	0.067	0.069
Site 220	0.059	0.046	0.059
Site 221	0.059	0.041	0.059

Vincinity Map



SITE FIELD DATA AND PHOTOGRAPHS COLLECTED ON AUGUST 27, 2008.

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCUARACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY.
FLIGHT DATES: November 2007

PHOTO LOCATIONS AND MANNING'S "n" VALUE SITES FOR CAVE CREEK TRIBUTARY 2

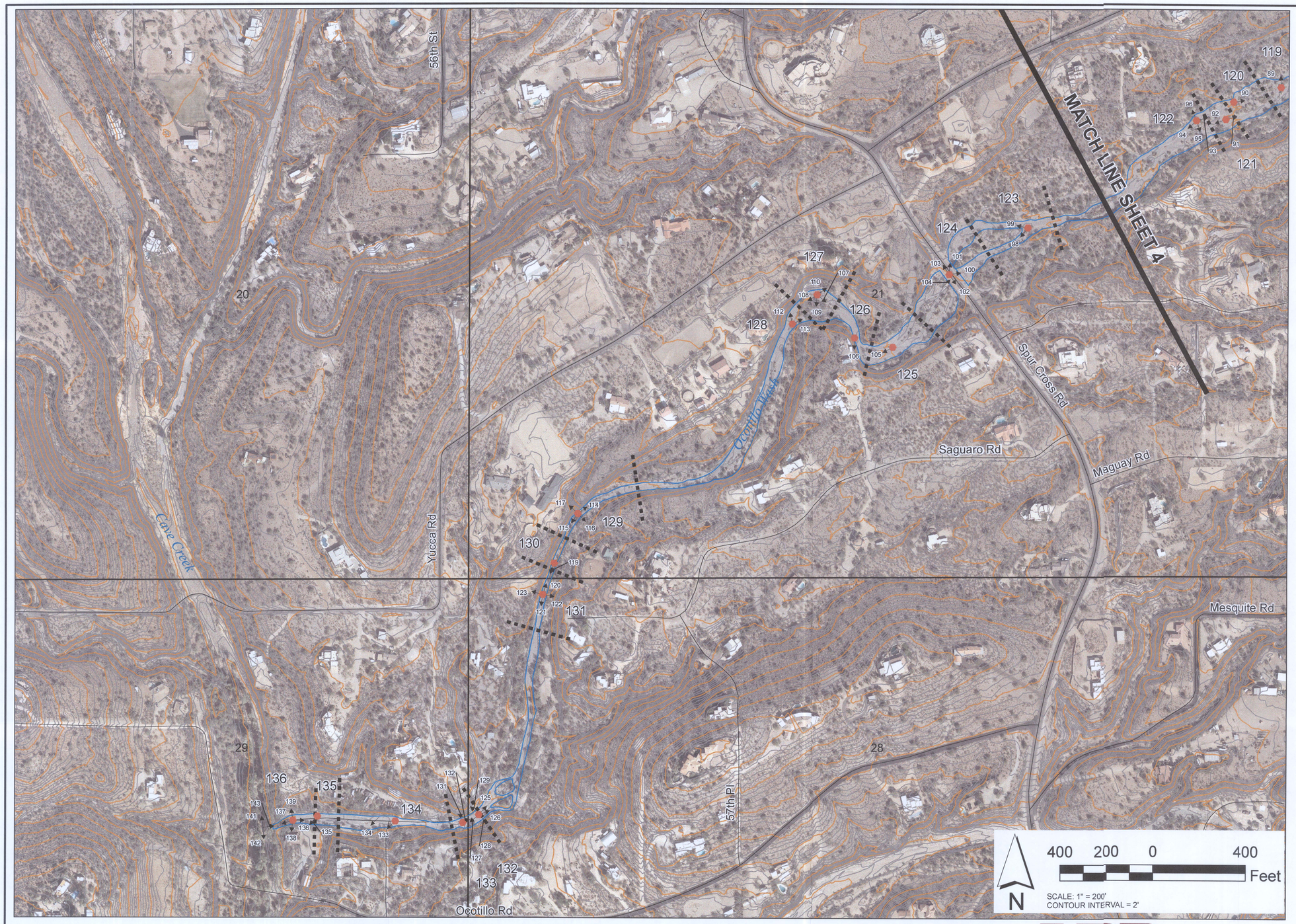
Flood Control District of Maricopa County

HDR

3200 EAST CAMELBACK ROAD, SUITE 350
PHOENIX, AZ 85018-2311
(602) 522-7700

FLOODPLAIN REDELINEATION STUDY OF OCOTILLO WASH AND TRIBUTARY-2, AND FLOODPLAIN DELINEATION STUDY OF CAVE CREEK TRIBUTARES 2 AND 3.
Project Contract Number: FCD2006C024
Work Assignement No. 2
HDR Project Number: 91427

OCTOBER 22, 2008



Legend

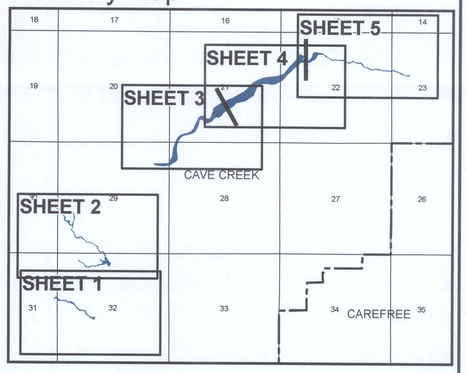
- 112 PHOTOGRAPHIC LOCATIONS
- 65 PHOTO DIRECTION/NUMBER
- MATCH LINES FOR SHEETS
- MANNING'S n VALUE BOUNDARY
- APPROXIMATE WASH BOUNDARY
- STREET ALIGNMENTS
- 31 SECTION LINES

CONTOURS-1254

- Index
- Intermediate

Site	Left Overbank	Main Channel	Right Overbank
Site 123	0.053	0.040	0.053
Site 124	0.048	0.040	0.048
Site 125	0.072	0.046	0.058
Site 126	0.075	0.046	0.055
Site 127	0.063	0.046	0.070
Site 128	0.069	0.046	0.061
Site 129	0.055	0.040	0.061
Site 130	0.053	0.040	0.057
Site 131	0.051	0.040	0.051
Site 132	0.051	0.042	0.051
Site 133	0.048	0.042	0.048
Site 134	0.060	0.045	0.048
Site 135	0.080	0.040	0.063
Site 136	0.063	0.040	0.063

Vincinity Map



SITE FIELD DATA AND PHOTOGRAPHS
COLLECTED ON AUGUST 27, 2008.

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1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY
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FLIGHT DATES: November 2007

PHOTO LOCATIONS AND MANNING'S "n" VALUE SITES FOR OCOTILLO WASH and OCOTILLO WASH TRIBUTARY-2

Flood Control District of Maricopa County

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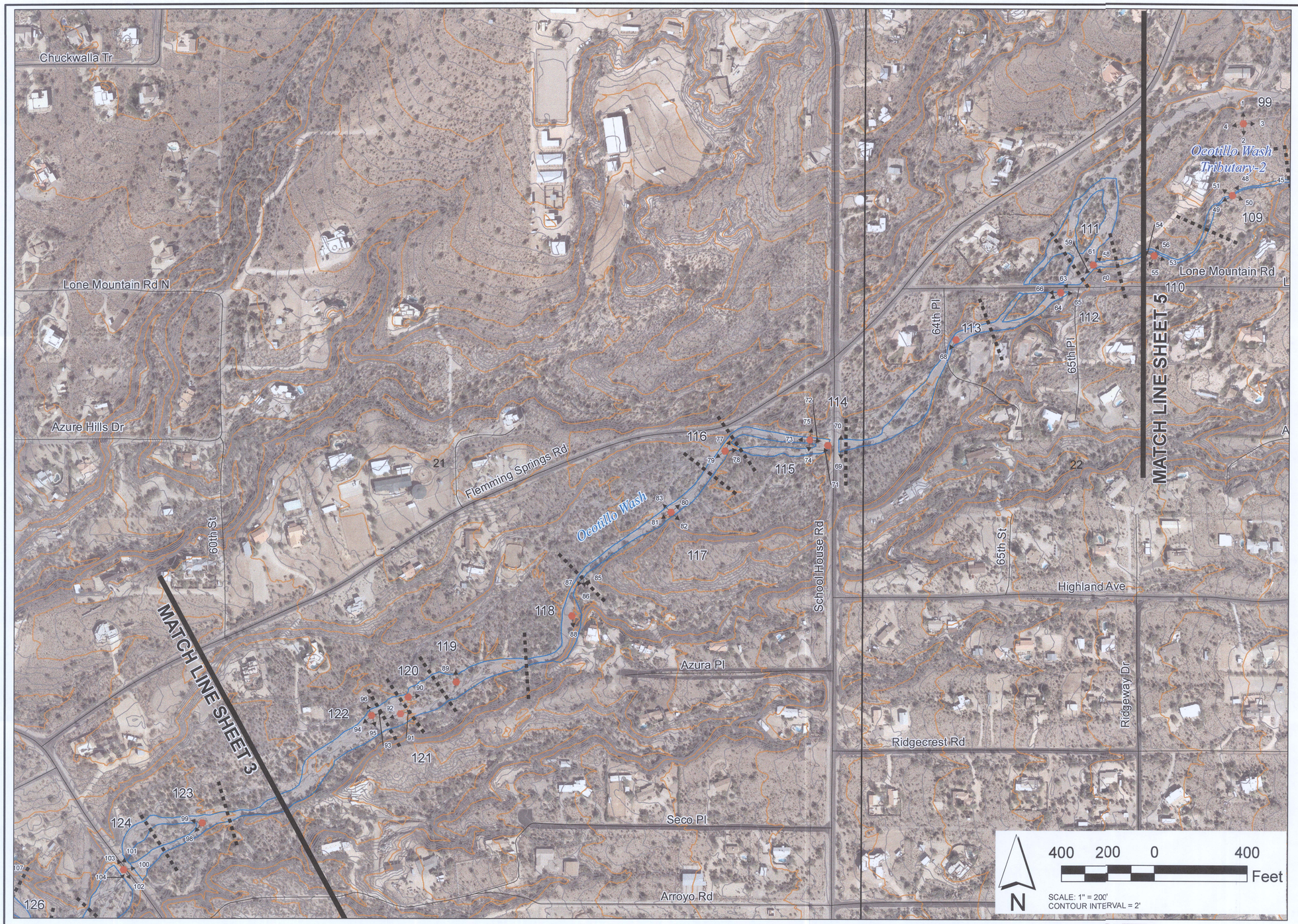
Project Contract Number: FCD2006C024
Work Assignement No. 2
HDR Project Number: 91427

SHEET 3 OF 5
OCTOBER 22, 2008



Legend

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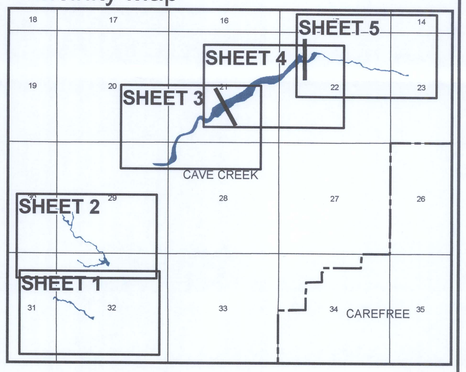
- APPROXIMATE WASH BOUNDARY
- 31 SECTION LINES

CONTOURS-1254

- Index
- Intermediate

Site	Left Overbank	Main Channel	Right Overbank
Site 111	0.058	0.053	0.052
Site 112	0.053	0.048	0.049
Site 113	0.053	0.040	0.044
Site 114	0.048	0.040	0.048
Site 115	0.048	0.040	0.048
Site 116	0.053	0.040	0.059
Site 117	0.063	0.040	0.058
Site 118	0.068	0.040	0.053
Site 119	0.053	0.055	0.048
Site 120	0.058	0.040	0.053
Site 121	0.063	0.040	0.053
Site 122	0.063	0.040	0.053

Vincinity Map



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GROUND CONTROL SURVEY DATA PROVIDED BY COOPER AERIAL SURVEYS COMPANY.
FLIGHT DATES: November 2007

PHOTO LOCATIONS AND MANNING'S "n" VALUE SITES FOR OCOTILLO WASH and OCOTILLO WASH TRIBUTARY-2

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Project Contract Number: FCD2006C024
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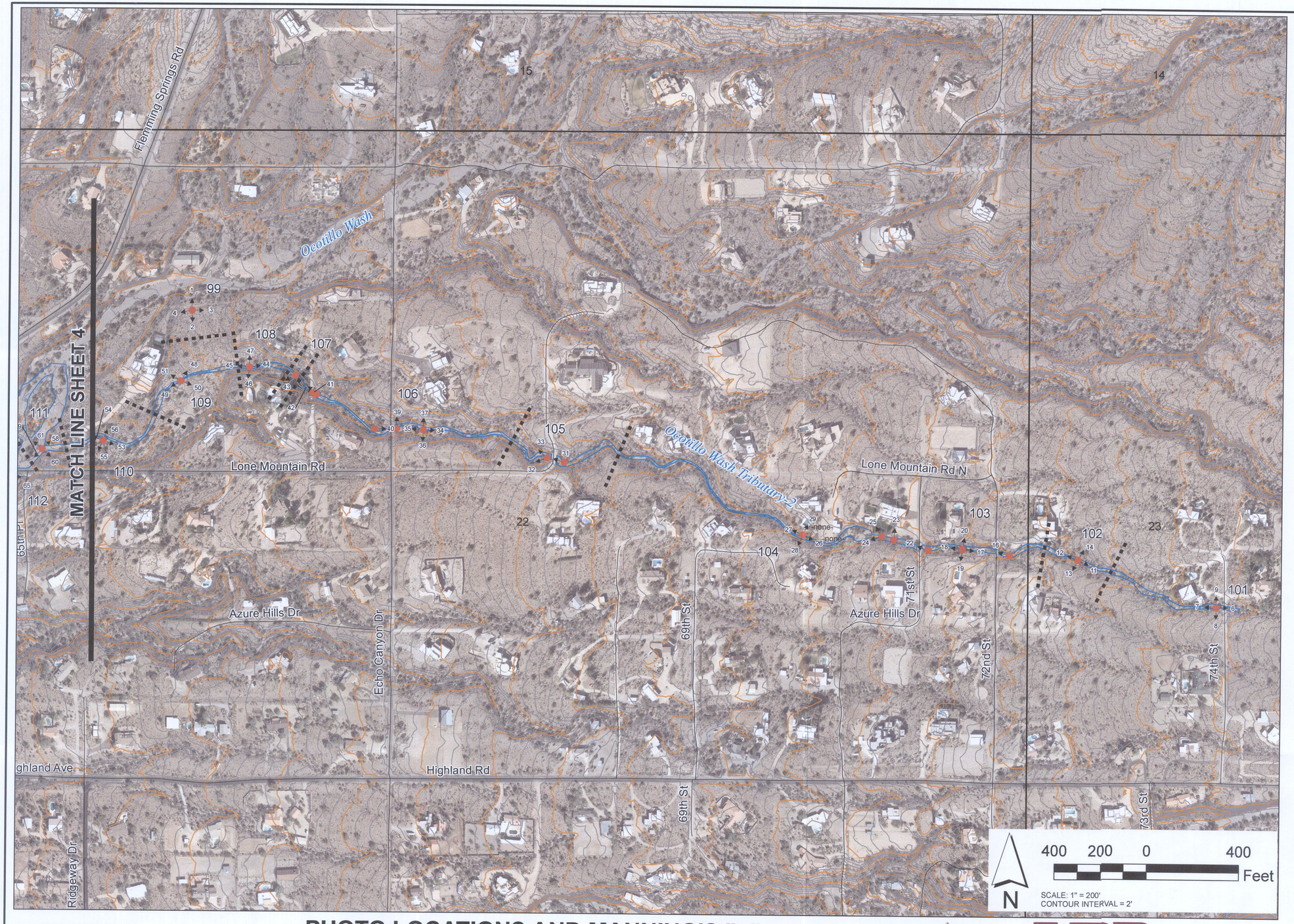
SHEET 4 OF 5
OCTOBER 22, 2008



Legend

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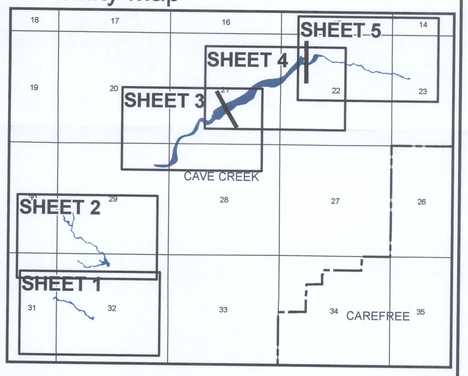
- 31 SECTION LINES

CONTOURS-1254

- Index
- Intermediate

Site	Left Overbank	Main Channel	Right Overbank
Site 99	0.051	0.039	0.041
Site 101	0.061	0.064	0.066
Site 102	0.056	0.086	0.056
Site 103	0.061	0.064	0.061
Site 104	0.061	0.064	0.061
Site 105	0.063	0.069	0.059
Site 106	0.056	0.056	0.056
Site 107	0.088	0.083	0.081
Site 108	0.056	0.058	0.056
Site 109	0.041	0.054	0.041
Site 110	0.051	0.059	0.051

Vincinity Map



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OCTOBER 22, 2008

APPENDIX G CD OF ELECTRONIC DATA FILES