HIGHLANDS WASH BASIN
MANAGEMENT PLAN REPORT

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Prepared for:

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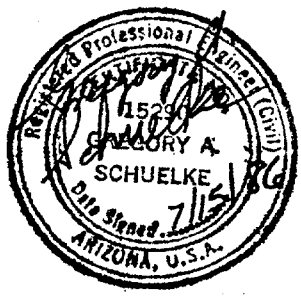

HIGHLANDS WASH BASIN MANAGEMENT PLAN

I. INTRODUCTION

The purpose of this study is to develop a basin management plan for Highlands Wash and the two washes west of Highlands Wash. The three phases of this study are:

Phase I - Analysis of Existing Drainage Conditions
Phase II - Formulation of Basin Management Alternatives
Phase III - Finalization of Recommended Plan.

The Highlands Wash basin was chosen for development of a basin management plan for several reasons including:

1. Its history of flooding in The Highlands, a trailer park development at the downstream end of Highlands Wash,

2. The high future development potential of the basin and the potential adverse impact of this future development on the existing downstream development, and

3. The numerous drainage complaints originating from residents in the area.

This report presents the analysis and conclusions from Phase I of the basin management plan study.

II. SCOPE OF WORK

The Scope of Work for Phase I of the Highlands Wash Basin Management Plan focused on evaluating existing flooding conditions as summarized below:

1) Review of Available Information
   a. Overview of basin characteristics: acreages, slopes, soils, vegetative cover, geology.

   b. Overview of information on land use, roads and utilities, archaeological features.

c. Flooding complaints and drainage reports on file at the Pima County Department of Transportation and Flood Control District, Flood Plain Management Section.

d. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps and reports, where applicable.

e. Aerial photographs.

f. Topographical mapping

Agencies to Contact for Information

a. Pima County Department of Transportation, Flood Plain Management Section.

b. Arizona Department of Water Resources.

c. U.S. Geological Survey, Water Resources Division.

d. Soil Conservation Service

e. City of Tucson

f. Watershed Resources Research Center, University of Arizona.

Other Agencies

a. U.S. Army Corps of Engineers

b. Bureau of Land Management

c. Forest Service

d. Arizona Game and Fish Department

2. Acquire Additional Data

a. Check soils map for geotechnical/soils information.

b. Call Arizona State Museum to check for archaeological features in basin.

c. Survey approximately eleven streambed cross-sections along Highlands Wash.

3. Reconnaissance Field Inspections

a. Examine general watershed and stream channel/drainageway characteristics.

b. Examine potential for detention/retention facilities.

c. Identify drainage structures as causes of flooding.

d. Identify existing flood hazards on a preliminary basis.

4. Analysis of Existing Drainage Conditions

Analysis of existing conditions should include the full range of recurrence intervals (2-, 5-, 10-, and 100-year events).

a. Prepare map of basins and sub-basins showing existing stream channels and drainage facilities.

b. Calculate peak runoff rates using the Pima County flood prediction method at concentration points chosen on the basis of the previous steps.

c. Compute capacities of existing drainage structures, drainageways, and stream channels using the Manning's Equation for Uniform Flow for the main channel portion of Highlands Wash.

d. Determine critical and balanced sub-basins within the project area and identify inadequate elements of the existing drainage system.

e. Examine relative impacts of urbanization with respect to cfs per acre values of runoff generated under projected developed conditions compared to existing conditions. Examine existing and proposed zonings and land use area plans relative to future runoff generation.

5. Prepare a report of the findings.

III. STUDY AREA

The study area is located twelve miles north of central Tucson and five miles west of the Coronado National Forest (see Figure 1, Location Map). The study drainage area extends from the Canada del Oro on the south to approximately two miles north of Moore Road on the north, from approximately the mid-section line of Sections 24, 25, and 36, (Township 11 South, Range 13 East) and Sections 1 and 12 (Township 12 South, Range 13 East) on the east to approximately the mid-section line of Sections 23, 26, and 35, (Township 11 South, Range 13 East) and Sections 2 and 11, (Township 12 South, Range 13 East) on the west (see Figure 2, Drainage Map).

The study area contains three washes, each terminating at the Canada del Oro Wash (see Figure 2). The easternmost wash is called Highlands Wash and has the largest drainage area of the three. Highlands Wash is 5.7 miles long and has a drainage area of 2.80 square miles upstream of Lambert Lane.

The center wash is unnamed and has the smallest drainage area. In this report it will be referred to as Center Wash. Center Wash is 1.21 miles long and has a drainage area at Lambert Lane of 0.29 square miles.

The westernmost wash is also unnamed. This wash has a sand and gravel operation on the State-owned land just below the centroid of the drainage area. Hence, it will be referred to as Gravel Pit Wash. The Gravel Pit Wash is 3.73 miles long and has a drainage area of 1.26 square miles at Lambert Lane. Immediately downstream from the sand and gravel operation is a desilting basin created by an earthen embankment that rises approximately four feet above the detained sediment pool on the upstream side with a 15- to 20-foot high embankment on the downstream side.

The vegetative growth within the Highlands Wash study area consists of desert brush with a cover density of approximately 20 percent. The mean basin slopes vary between 1.5 and 4.4 percent. Slopes in excess of 4.4 percent are present near the basin boundaries and in small localized areas within the study area. The soils are typically gravelly or cobbly sandy loam with some rock outcrops and some gravelly clays.

As described in the Pima County Hydrology Manual (reference 1) an hydrologic soil group represents a group of soils having the same runoff potential under

similar storm and cover conditions. Surface soils which materially affect the rate of runoff have been classified into four major groups according to the infiltration rate of each soil. These soils are defined as follows:

Group A: (Low runoff potential) Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively well drainage sands or gravels. These soils have a high rate of water transmission. Group A soils are generally not found within Pima County, Arizona.

Group B: Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C: Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of soils with a layer that impedes the downward movement of water, or soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission.

Group D: (High runoff potential) Soils having a very slow infiltration rate when thoroughly wetted, consisting chiefly of clay soils with a high swelling potential; soils with claypan or clay layer at or near the surface; and shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

These alluvial soils are subject to erosion and aggradation during significant runoff events. The Hydrologic Soils Map (see Figure 3) delineates soil types by their hydrologic soil grouping.

Four roads traverse the study area from west to east. Moore Road on the north extends from the west drainage boundary to the Section line midway across the drainage boundary. Moore Road is an unimproved road that extends east only to the west bank of Highlands Wash. Tangerine Road is a paved road that crosses the entire width of the study area one mile south of Moore Road. Naranja Road is a paved road excepting the portion that crosses Highlands Wash where the road consists of an unpaved, at-grade, dip section crossing. Lambert Lane on the south is a paved road consisting of an at-grade dip section at wash crossings.

Less than half of the study area has been surveyed for archaeological sites. In the surveyed areas, at least six prehistoric sites have been identified. The Arizona State Museum indicated that there is a high probability that many more sites lie within unsurveyed parcels (see letter, Appendix C). All unsurveyed parcels should be field-checked prior to working in the study area. A map of identified prehistoric sites and areas surveyed has been sent to the Pima County Department of Transportation and Flood Control District under separate cover.

Private water and sewage systems service developed areas within the study area. Powerlines were identified along all four Section line roadways and at the north end of The Highlands development. An underground telephone cable was exposed under the 7-foot diameter corrugated metal pipe on the south side of Tangerine road. No other utilities were identified in the study area.

The study area is relatively undeveloped except for The Highlands, a trailer park developed in the early 1960's and located adjacent to the downstream quarter-mile of Highlands Wash. The trailer park is protected from wash flows by a 1- to 4-foot high earthen embankment along the entire north property line. This embankment concentrates the Highland Wash flows into the channel through the development (see Figure 4, The Highlands Development). In general, the channel has a bottom width ranging from 20 to 35 feet, a depth of 4 to 8 feet, with sideslopes of 2.0 (horizontal) to 1 (vertical). The majority of the channel is unarmored with a bottom consisting of sand and gravel and sideslopes consisting of sand, gravel, silts, and clays. The sideslopes contain a fair vegetation growth of brush and shrubs with intermittent portions containing concrete slope protection. However, at several locations along the channel, erosion has attacked the sideslope and vegetation growth, leaving near vertical sideslopes. The only culverted crossing of the channel occurs at Matterhorn Street, where three 48-inch diameter concrete pipes have been installed under the road crossing.

IV. AVAILABLE INFORMATION

Available information on Highlands Wash obtained for the study included:

1) U.S. Geological Survey 7½ minute quadrangle map, Oro Valley, Arizona.

2) An advance copy of the Soil Conservation Service Tucson Soil Survey to be published in 1986 defining soil types and their hydrologic soil groups (see Figure 3, Soils Map).

3) A summary of drainage complaints compiled by the Pima County Department of Transportation and Flood Control District.

4) Rancho Vistoso Neighborhood Plan No. 5 (May 3, 1982) from Pima County Planning and Development Services (see Figure 5, Zoning Map).

5) Draft Rancho Vistoso Community Plan (December 10, 1985) from Pima County Department of Transportation and Flood Control District.

6) Unincorporated Areas of Pima County, Arizona, Flood Insurance Rate Map (February 15, 1983) Panel 1040 of 4700 Federal Emergency Management Agency (FEMA). The FIRM map indicates that the entire Highlands Wash basin study area is located in a Zone C hazard area which indicates areas of minimal flooding. It is noted that the Flood Insurance Study did not perform a detailed study of this area.

7) Results of Archaeological survey by the Arizona State Museum (see Appendix C).

8) A bibliography of publications by the Southwest Rangeland Watershed Research Center, United States Department of Agriculture, Agricultural Research Service, Tucson, Arizona was obtained. The bibliography contained many publications regarding precipitation characteristics, transmission losses, water yield, rainfall-runoff relationships etc. on arid watersheds. No publications were identified regarding results of specific studies in the Highlands Wash area. The data available in these publications may have value for future studies of Highlands Wash, but was beyond the scope of work of this study.

9) Input from the Arizona Game and Fish Department (see Appendix C).

10) Land ownership information from the United States Bureau of Land Management (See Figure 5, Zoning Map).

11) The United States Forest Service was contacted for input to the study on Janaury 10, 1986 with no response received at the time this report was written.

12) The City of Tucson was not contacted for input on the Phase I portion of this study because the study area is outside the City of Tucson Corporate Limits and does not contain any City utilities or roads at this time.

13) Input from Arizona Department of Water Resources was obtained regarding the Dam Safety Program and the Gravel Pit Wash Desilting Basin.

14) The United States Geological Survey (USGS), Water Resources Division was contacted to determine if any gage station streamflow data was available. The USGS has not now nor in the past maintained any gage stations within the basin study area.

V. ADDITIONAL DATA ACQUIRED

A site visit was made to obtain information on hydrologic soil and cover types and densities in the study area, structure types and sizes, and to obtain detailed cross-sections of Highlands Wash for the floodplain analysis (see Figures 2 and 4 and Appendix B).

During the site visit, it was determined that the study area is covered by desert brush with an average density of approximately 20 percent. Some localized areas have greater cover densities such as the area immediately upstream of Tangerine Road and Moore Road. The Gravel Pit Wash has two road crossings with culverts, one consisting of a seven-foot diameter corrugated metal pipe under Tangerine Road and the other consisting of five, 72-inch by 44-inch corrugated metal pipe arch culverts under Naranja Road. Highlands

Wash has a 7-foot diameter corrugated metal pipe under Tangerine road. A 60-foot wide drainageway ranging in depth from 4 to 8 feet, bisects The Highlands development to convey Highlands Wash flows through the development. Three, 4-foot diameter reinforced concrete pipes and a dip section convey Highlands Wash flows across Matterhorn Street at the downstream end of the development. All other roads in the study area that cross the three major washes have at-grade dip section crossings to pass runoff across the roadway.

During the site visit it was noted that the Lambert Lane dip section road crossings of all three washes showed evidence of significant sediment deposition. The sediment deposition would be expected considering the main wash slopes decrease proceeding downstream and the washes are relatively unconfined at the Lambert Lane Road crossing, resulting in the loss of energy and observed sediment deposition.

During the site visits, the washes in the study area were observed to be generally unstable. The upstream reaches of the main washes and tributaries have relatively steep slopes and exhibit degradation (downcutting). The downstream reaches of the main washes and the tributaries are of lesser slope and exhibit aggradation. In evaluating the potential for detention/retention facilities within the study area, it would seem that detention/retention facilities constructed within the main washes which are in an aggradation regime would have a significant impact on the sediment transport relationship of the washes. It would seem that a better location for retention/detention basins would be within the smaller tributaries to the main washes, where attenuation of the local flows can be attained while minimizing disturbance to the sediment transport relationship of the drainage system as a whole.

The Gravel Pit Wash contains a sediment basin below the gravel pit. The sediment pool is detained by an earthen embankment that rises approximately four feet above the detained sediment pool on the upstream side and approximately 15- to 20-feet above the bottom of the wash on the downstream side. On the east end of the embankment is an approximately 20-foot wide overflow spillway section. Figure 6 is a sketch of the embankment and spillway.

Twelve (12) cross-sections were field surveyed along the main channel of Highlands Wash below Moore Road. Eight of the cross-sections are between Lambert Road and immediately upstream of the The Highlands trailer park (see

Figures 2 and 4). The detailed cross-sections obtained were used to determine flooded areas between Moore Road and Lambert Road using the Manning's Equation for Uniform Flow.

An additional field visit was requested by the Pima County Department of Transportation and Flood Control District to assess and evaluate a flood event which occurred on August 24-25, 1985 at The Highlands trailer park. In summary, the east end of the diversion levee breached and flooded lot 40 (see Figure 4) of the trailer park. The culverts under Matterhorn Street were partially obstructed and floodwater overtopped the street at that location (see Appendix C, Letter Report of August 26, 1985 Field Visit). There was evidence of bank erosion along the 60-foot drainage easement through The Highlands and also along the embankment across the north boundary of the development, especially east of the drainageway inlet. The earthen embankment has no bank protection, excepting a short portion of the west embankment as it transitions into the drainageway. There are two grade control structures at the upstream end of the drainageway. Some evidence of erosion downstream of the grade control structures was evident and deposition of sediment had occurred at the upstream end of the culverts under Matterhorn Street due to vegetation partially blocking the culverts during the storm event.

VI. ANALYSIS OF EXISTING CONDITIONS

A. Hydrology:

Drainage area and sub-area boundaries were delineated using the U.S. Geological Survey, Oro Valley, Arizona 7½-minute quadrangle map. Eleven sub-basins were chosen and delineated to obtain peak discharges at major tributary confluences, near road crossings and developments. Peak runoff rates for the 2-, 5-, 10-, and 100-year flood events were calculated at the eleven concentration points indicated on Figure 2.

Peak runoff rates were determined using the flood prediction method found in the Hydrology Manual for Engineering Design and Flood Plain Management within Pima County, Arizona, September 1979, (see Appendix A, Hydrologic Calculation Data Sheets).

The existing condition peak discharges were calculated assuming a 20 percent cover density and no impervious cover. A summary of the existing and future developed condition peak discharges computed for the four frequencies analyzed is shown in Table 1. The 100-year discharges at Lambert Lane for the Gravel Pit Wash and the Center Wash are 1,731 and 622 cubic feet per second (cfs), respectively. The 100-year discharge for Highlands Wash at Lambert Lane is 3,386 cfs.

B. Hydraulic Analysis

A hydraulic analysis was performed only on the main channel of Highlands Wash. The Manning's Equation was used to evaluate the 100-year floodplain limits below Moore Road (see Appendix B, Floodplain Hydraulic Calculations and Streambed Cross-Sections).

The hydraulic capacity for the existing drainage channel through The Highlands trailer park was determined by a Manning's equation analysis at each of the surveyed cross-sections. The most restricted channel capacity was computed to be 1,990 cfs at cross-section No. 5, approximately 350 feet upstream of Matterhorn Street. Under existing conditions, the road crossing at Matterhorn Street involving three 48-inch diameter reinforced concrete pipe culverts and a dip section has the most restricted culvert capacity along Highland Wash. The capacity of the three 48-inch reinforced concrete pipe culverts is approximately 290 cfs (see Table 2, Road Crossing Inventory and Appendix B). Discharges in excess of 290 cfs begin to break out of the channel section onto the adjacent roadway and property.

The calculated capacities of the culverts and channel assume no culvert blockage or channel aggradation or degradation. The amount of sediment deposition or degradation of the culvert is dependent upon the percent of blockage of the culvert, velocities of flows, frequency of flows, and the amount of sediment in the wash system. After the debris blockage of the culverts during the August 1985 storm, the culverts were about half-full of deposited sediments. The channel capacity is dependent upon the depth and width of the channel, the amount of debris and vegetation in the channel, and the slope of the channel. All of these characteristics are changing during and after storm events. Capacities of the culverts and the channel are, therefore, changing in non-fixed bed systems.

TABLE 1
HIGHLANDS WASH BASIN

SUMMARY OF DISCHARGES

DRAINAGE AREA I.D.	DRAINAGE AREA (Sq. Mi.)	EXISTING CONDITION 100-yr.	10-yr.	5-yr.	2-yr.	100-yr. CSM	FUTURE CONDITION 100-yr.	10-yr.	5-yr.	2-yr.	100-yr. CSM	RATIO OF EXISTING/ FUTURE 100-yr. CSM
W-1 C*	1.26	1,742	623	364	122	1,383	3,135	1,562	1,192	702	2,488	1.80
W-1 L*	0.18	490	185	114	36	2,722	586	260	181	94	3,256	1.20
W-2 C	1.08	1,681	637	381	128	1,556	3,131	1,672	1,269	795	2,899	1.86
W-2 L	0.50	944	351	215	70	1,888	1,687	918	703	439	3,374	1.80
W-3 C	0.58	1,235	508	327	136	2,129	2,070	1,153	890	561	3,569	1.68
W-3 L	0.28	704	292	191	75	2,514	1,216	652	515	343	4,343	1.73
W-4 L	0.30	840	371	247	108	2,800	1,257	706	556	350	4,190	1.50
H-1 C	2.80	3,386	1,204	757	290	1,209	5,617	2,682	1,950	1,129	2,006	1.66
H-1 L	0.27	1,004	481	335	184	3,719	1,174	587	440	246	4,348	1.17
H-2 C	2.53	3,121	1,125	690	232	1,234	4,907	2,340	1,718	938	1,940	1.57
H-2 L	0.59	1,345	495	294	94	2,280	1,807	981	659	376	3,062	1.34
H-3 C	1.94	2,806	1,053	671	248	1,446	4,109	2,033	1,507	857	2,118	1.46
H-3 L	0.37	936	357	219	72	2,530	1,410	719	527	324	3,811	1.51
H-4 L	1.24	2,075	909	695	225	1,673	2,859	1,418	1,035	585	2,306	1.38
H-5 L	0.33	724	281	178	66	2,194	1,233	682	515	320	3,736	1.70
C-1 C	0.29	692	252	149	46	2,386	1,161	619	482	310	4,003	1.68
C-1 L	0.18	515	192	117	38	2,861	830	440	335	217	4,611	1.61
C-2 L	0.11	368	148	89	30	3,345	518	308	249	173	4,709	1.41

***NOTE:**

C - indicates flows at concentration point for total drainage area.

L - indicates local flows from drainage area between concentration point indicated and next concentration point upstream.

CSM - cubic feet per second per square mile

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TABLE 2

ROAD CROSSING INVENTORY

WASH	ROADWAY	100-YEAR DISCHARGE (cfs)	CULVERT PARAMETERS		ESTIMATED 100-YEAR FLOODING PARAMETERS OVER ROADWAY			CAPACITY OF CULVERT AND ROAD AT 1.0' DEPTH OVER ROAD (cfs)
			QUANTITY - SIZE	DISCHARGE*	FLOODED WIDTH (feet)	DEPTH (feet)	AVERAGE VELOCITY (fps)	
Highlands Wash	Moore Road	2,799	(no culvert)		(no roadway across wash)			
	Tangerine Road	2,806	1 — 7' Dia. CMP	410 cfs	340	2.1	3.5	929
	Naranja Road	3,121	(no culvert)		220	2.1	12.3	545
	Matterhorn	3,386	3 — 4' Dia. RCP	290 cfs	120	4.85	5.5	485
	Lambert Lane	3,386	(no culvert)		230	2.8	5.2	600
Center Wash	Naranja Road	368	(no culvert)			NOT ESTIMATED		
	Lambert Lane	692	(no culvert)			NOT ESTIMATED		
Gravel Pit Wash	Moore Road	840	(no culvert)			NOT ESTIMATED		
	Tangerine Road	1,235	1 — 7' Dia. CMP	370 cfs		NOT ESTIMATED		
	Naranja Road	1,681	5 —72"x44" CMPA	750 cfs		NOT ESTIMATED		
	Lambert Lane	1,742	(no culvert)			NOT ESTIMATED		

RCP - Reinforced Concrete Pipe
CMP - Corrugated Metal Pipe
CMPA - Corrugated Metal Pipe Arch
Dia. - Diameter

* Discharge is for flow depth at top of road.

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The 100-year floodplain is delineated on Figure 2, Drainage Map and Figure 4. Cross-sectional information used for this analysis is provided in Appendix B. A level water surface was assumed for the Manning's Equation normal depth analysis used to evaluate the extent of flooding for the 100-year flow.

The existing condition 100-year floodplain hydraulic calculations from this study could not be compared to the Federal Emergency Management Floodplain Boundary and Floodway Maps. The Federal Emergency Management Agency Flood Insurance Study Program did not study the Highlands Wash study area in detail. A general Zone C hazard designation was given for the entire area denoting areas of minimal flooding potential.

VII. IDENTIFICATION OF INADEQUATE ELEMENTS

A. Sand and Gravel Pit Settling Pond Embankment:

A sketch of the embankment and spillway section for the desilting basin in shown on Figure 6. The spillway capacity of the sand and gravel pit settling pond (Q = 631 cfs at 4-foot deep) is inadequate to pass the approximate 100-year flow of 1,681 cfs (Drainage Area I.D. W-2). Assuming the embankment acted like a weir and did not breach, the water would need to be approximately 1.0 foot deep over the embankment and 5.0 feet deep in the spillway to pass the 100-year discharge (see calculations, Appendix B). Breaching of the embankment under these conditions would be likely. Since the structure impounds sediment rather than water and because the area downstream of the embankment is currently undeveloped, the breaching would probably not be catastrophic at this time. As the area downstream of the embankment develops, the consequences of an embankment failure increase. If the embankment fails, runoff flowing through the breached section is likely to be heavily laden with sediment. As the flow spreads out downstream of the branch, the flow depths and velocities will also decrease thereby decreasing the amount of sediment being transported by the flow, resulting in significant downstream aggradation.

The Arizona Department of Water Resources was contacted by telephone to determine whether the Gravel Pit Desilting Basin had been evaluated by the Arizona Department of Water Resources as part of their Dam Safety

Program. The Gravel Pit Desilting Basin has a maximum temporary storage volume of 20 to 30 acre-feet and maximum height from spillway invert to downstream channel invert of approximately 15 feet. Based on this size criteria, the Gravel Pit Desilting Basin would not be of sufficient potential hazard to be included within the Arizona Department of Water Resources Dam Safety Program jurisdiction.

B. Culvert Under Tangerine Road

The seven-foot diameter corrugated metal pipe culvert under Tangerine Road at Highlands Wash (Q = 410 cfs) does not have a 100-year capacity of 2,806. The 100-year flow depth over the road would be approximately 2.1 feet (see Table 2, Road Crossing Inventory and culvert and weir flow calculations in Appendix B). The combined capacity through the culvert and over the roadway at a depth of 1.0 foot over the top of the road is 929 cfs (see Table 2 and Appendix B).

C. Roadway Dip Sections

A summary of roadway dip section crossings and flow characteristics is contained in Table 2, Road Crossing Inventory. In general, the roadway dip sections on the main channel of Highlands Wash would be impassible during the 100-year flood event due to the depth of water in the road (2 to 3 feet deep), sediment deposits in the road and/or the velocity of floodwaters (5 to 12 feet per second) across the roadway (see Appendix B and Table 2, Road Crossing Inventory). As the floodwaters recede, the utility of these roads would be questionable.

D. Highlands Trailer Park Diversion Levees

The diversion levees along the north perimeter of the Highlands Trailer Park are inadequate to divert the 100-year flows to the outlet channel. The levees are 1 foot to 4 feet high with a top of dike varying from approixmately 3 to 8 feet wide. They are unprotected earthen levees which have experienced erosion of their upstream banks. The stability is questionable due to the evidence of bank attack and their inadequate height, especially the eastern levee. The August 1985 storm breached a portion of the eastern levee where the levee was only about one foot above the desert floor on the upstream side (see Appendix C). These levees are within a private drainage easement of The Highlands subdivision. According to the May 24, 1982 letter from the Pima County Department of Transportation and Flood Control District (see Appendix C)

the maintenance of these channels and levees is the responsibility of the subdivision owner. There was no evidence during site visits that any bank protection had been installed in areas of bank erosion. It is noted that following the levee breach of August 1985, the breach was filled in with uncompacted native streambed material with no bank protection provision. An additional breach of the levee at this location is highly probable during the next significant storm event.

E. Highlands Trailer Park Channel

The existing channel through The Highlands trailer park does not have a 100-year capacity. The existing channel capacity is approximately 1,990 cfs (see Section 5 and Appendix B). There is one grade control structure upstream and one downstream of Appalacian Street. The earth-lined channel cross-section is approximately 20 to 35 feet across at the invert, has 2:1 side slopes, and is 4 to 8 feet deep. The channel flows through three, 48-inch diameter reinforced concrete pipes under Matterhorn Street, transitions to flow across Lambert Lane as deep sheet flow and then flows overland to the Canada del Oro Wash (see Figure 4 and Appendix B).

F. Culvert and Dip Section on Matterhorn Street

These culverts, three 48-inch diameter reinforced concrete pipes, have a combined capacity of 290 cfs which is equal to the existing 2-year flood event (Q_2 = 290 cfs). Minimal flood damage would occur at the 2-year flood level. However, the 10-year flood (Q_{10} = 1,204 cfs) and 100-year flood (Q_{100} = 3,386 cfs) would flow almost two and one-half feet deep and five feet deep, respectively, over the dip section, thus causing damage to adjacent property (see Figure 4 and Table 2).

VIII. EVALUATION OF POTENTIAL IMPACTS OF URBANIZATION

The hydrology of the three washes evaluated in this study was analyzed for future urbanization using the most current development plans (see References 3 and 4) to determine the impacts of zoning densities. The future condition peak discharges were calculated assuming a 20 percent cover density on pervious areas. A weighted average percent impervious cover for the drainage subareas was estimated using proposed land use densities from the community plans (see Figure 5 and References 3 and 4) and recommended percent

impervious for the respective land uses as indicated in the Pima County Hydrology Manual page 103 (Reference 1). No detention was assumed to be provided in computing the future condition peak discharges.

On a cfs-per-square mile basis, the future 100-year peak discharges increased 1.4 to 1.7, 1.2 to 1.9, and 1.2 to 1.7 times the existing 100-year peak discharges for the Center Wash, the Gravel Pit Wash, and Highlands Wash, respectively (see Table 1, Summary of Discharges).

The impact of future urbanization is deemed to be greatest for Highlands Wash since the downstream reach of the wash has been developed with a capacity less than the 100-year flood event. In fact, current capacity is less than a 2-year event at the most restrictive point. Flooding and associated damages will become more frequent and severe to The Highlands trailer park as upstream urbanization occurs.

A comparison of cfs-per-acre versus drainage area was performed for each subarea and each concentration point in the study area. The plot (see Figure 7) did not identify any one subarea that would appear to be more critical than the others. In every case, the outflow from the new development increased the 100-year discharge from the subarea.

The need for retention/detention facilities exist in the Highlands Wash basin above The Highlands development in order to restrict runoff to the design capacity of the existing channel. If peak flows are not reduced, this existing development will experience increases in flooding within the development.

IX. CONCLUSIONS

Inadequate elements identified within the study basins were:

1) sand and gravel pit embankment and spillway,
2) the culvert under Tangerine Road in Highlands Wash,
3) the roadway dip sections throughout the study area,
4) the diversion levees on the north perimeter of the Highlands Trailer Park,
5) the diversion channel through the Highlands Trailer Park, and

6) the culvert and dip section in Matterhorn Street in the Highlands Trailer Park,
7) Drainage crossings at Lambert Lane.

The projected increase in the peak flows due to future urbanization will aggravate these already inadequate elements in the study area. As the study area develops, the likelihood of significant property damage occurring due to flooding will increase. At present, the majority of the study area remains undeveloped. Therefore, the opportunity exists to develop a basin management plan for this area prior to additional significant development. Such a plan would allow the basin to develop under a regional concept concerned with the basinwide effects of solutions for the inadequate elements in the study area.

Based on the existing and developed condition discharge calculations and the existing condition channel and road crossing capacities, it is probable that some level of retention/detention would be necessary for future development of the basin. However, it is recommended that onsite detention/retention facilities not be constructed within the main wash channels (existing 100-year peak discharges above 1,000 cfs). The facilities may, however, discharge into the main washes. This provision is recommended in order to minimize disruption of the sediment transport relationship of the main channels, while maintaining their continuity.

One possible alternative for alleviating the major inadequate elements identified by this study as part of the Highlands Wash Basin Management Plan would involve improving the diversion levees and channel through The Highlands subdivision while imposing retention/detention on the future upstream development. The channel capacity through the existing Highlands trailer park could be increased. A preliminary analysis for improving the existing channel would involve proposing a concrete-lined channel within the existing 60-foot easement in addition to raising and armoring the upstream diversion levee and increasing the culvert crossing of Matterhorn Street, while maintaining a reasonable freeboard for a properly designed facility. It is estimated that the channel capacity through The Highlands could be increased to approximately 2,700 cfs with this channel improvement (see hydraulic calcualtions and Drainage Easement Profile in Appendix B).

Therefore, to create a balanced basin, additional retention/detention from upstream development would be required to reduce the existing condition peak

100-year discharge of 3,386 cfs to the proposed 2,700 cfs channel capacity, a decrease to approximately 80 percent of existing conditions. This alternative is only presented as a possibility at this time. Formulation of specific structural and non-structural flood control alternatives and comparative analysis of alternatives are tasks be performed as part of Phase 2 of this study.

* * * * *

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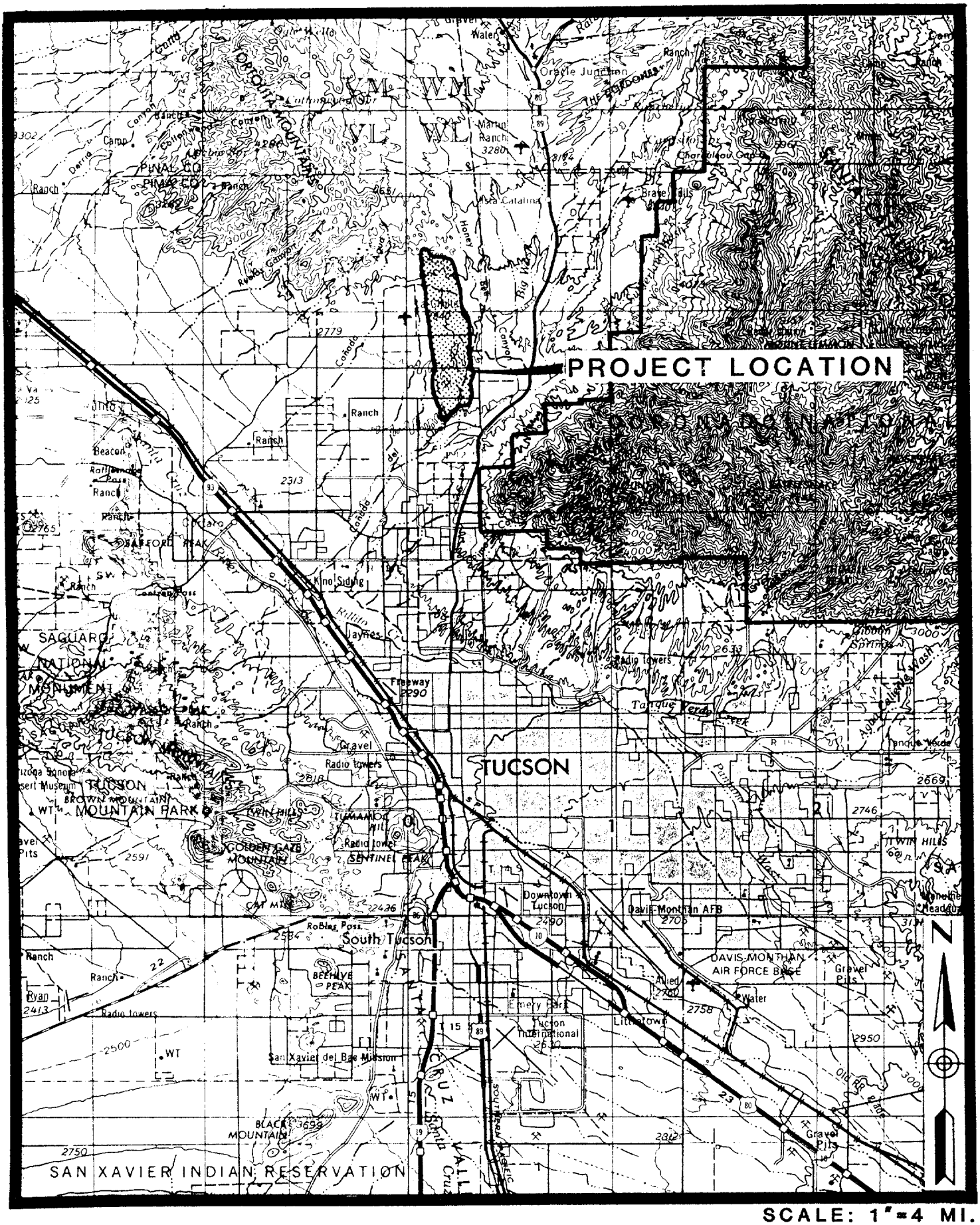
Figures



SCALE: 1"=4 MI.

HIGHLANDS WASH BASIN MANAGEMENT PLAN-PHASE 1

LOCATION MAP

ANDERSON-NICHOLS & CO., INC.

FIGURE 1

EXPLANATION

H-2 CONCENTRATION POINT

APPROXIMATE 100-YEAR FLOODPLAIN

NOTES:
1. SEE FIGURE 4 FOR CROSS-SECTION 1-8 LOCATIONS AND FLOODPLAIN THROUGH THE HIGHLANDS
2. SEE APPENDIX B FOR PLOTS OF CROSS-SECTIONS 1-12 AND HYDRAULIC CALCULATIONS

SCALE 1"= 2000'

Drainage Area Boundary

Drainage Area Boundary

End of Floodplain Analysis

X-Section #12

X-Section #11

X-Section #10

X-Section #9

X-Section #8

H-1

H-2

H-3

H-4

H-5

W-1

W-2

W-3

W-4

C-1

C-2

Sand & Gravel Pit Settling Pond Embankment

Diversion Levee

Highland Trailer Park Drainage Channel

Approximate 100-Year Floodplain

HIGHLANDS WASH BASIN
MANAGEMENT PLAN-PHASE 1

DRAINAGE MAP

FIGURE 2

023

HYDROLOGIC SOIL GROUPS

B

C

D

SCALE 1"=2000'

HIGHLANDS WASH BASIN
MANAGEMENT PLAN-PHASE 1

HYDROLOGIC SOILS MAP

FIGURE 3

N

Scale : 1" = 200'

UNDEVELOPED

The Highlands Diversion Levee

Highlands Wash

Breach Due to 8/24/85 Flood Event

The Highlands Diversion Levee

APPALACHIAN STREET

ANDES STREET

ADIRONDAK STREET

WEISSHORN STREET

SHENANDOAH STREET

EVEREST AVENUE

60' DRAINAGEWAY — Q_{100} = 1675 cfs

KILIMANJARO AVENUE

KITTATINNY AVENUE

RAINIER AVENUE

MONT BLANC AVENUE

OLYMPUS STREET

VESUVIUS STREET

MATTERHORN STREET

THE HIGHLANDS DRIVE

LAMBERT LANE

UNDEVELOPED

UNDEVELOPED

UNDEVELOPED

UNDEVELOPED

UNDEVELOPED

Existing 45' Drainage-way

38 39 40 41

1 2 3 4 5 6 7 8

CANADA DEL ORO

LEGEND

Flow Path

② Cross Section I.D.

Flood Prone Area (Less Than One Foot Deep on Average)

HIGHLANDS WASH BASIN
MANAGEMENT PLAN-PHASE 1

THE HIGHLANDS
DEVELOPMENT

FIGURE 4

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EXPLANATION

P/S	PARK OR SCHOOL
G.C.	GOLF COURSE
C	COMMERCIAL
CH	CHURCH
U	UTILITY
O.S.	OPEN SPACE
4	DENSITY: UNITS/ACRE

SCALE: 1"-2000'

DRAFT RANCHO VISTOSO COMMUNITY PLAN

RANCHO VISTOSO NEIGHBORHOOD PLAN #5

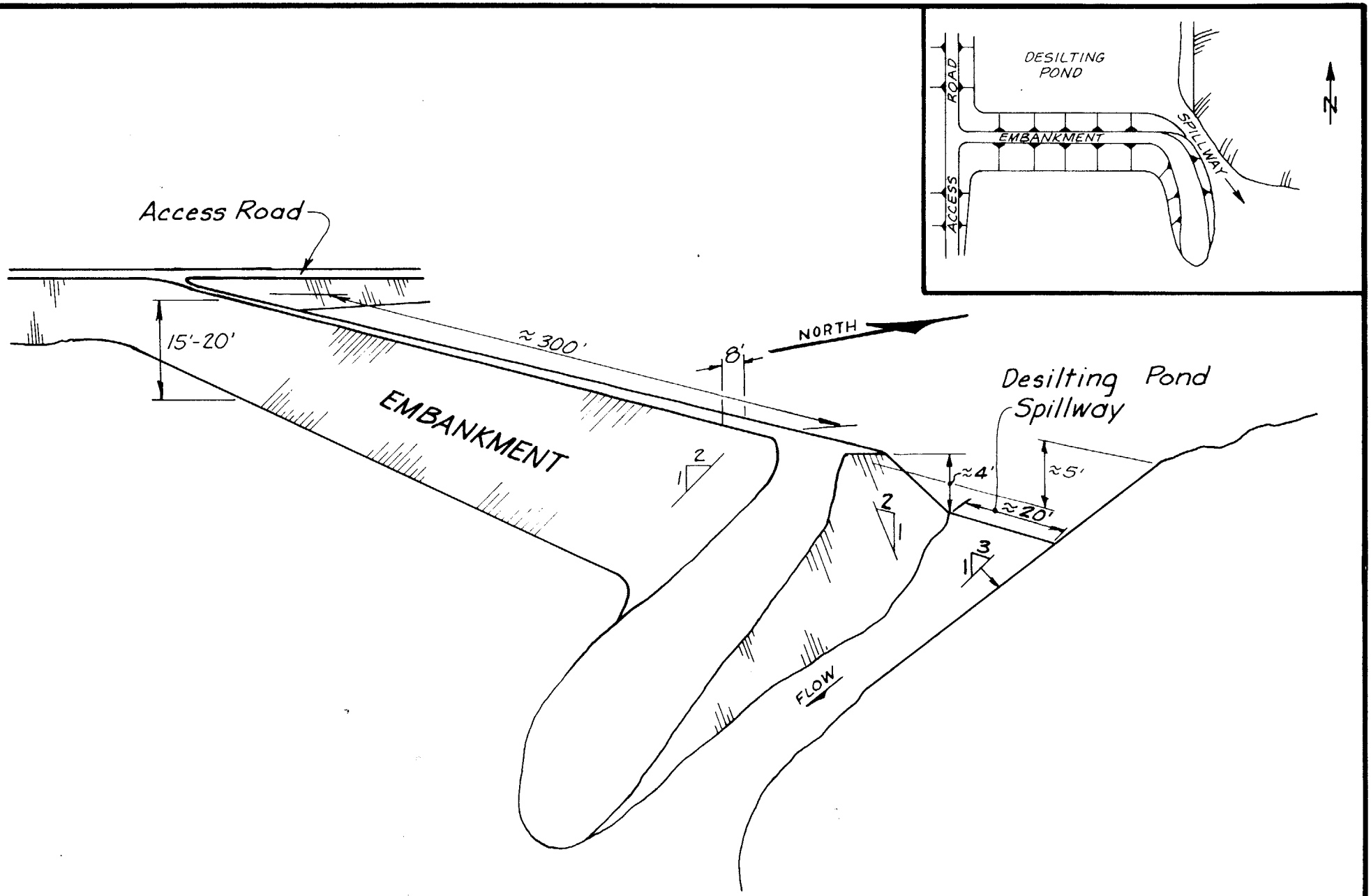
TORTOLITA COMMUNITY PLAN

ARIZONA STATE LAND

HIGHLANDS WASH BASIN MANAGEMENT PLAN-PHASE 1

ZONING MAP

FIGURE 5



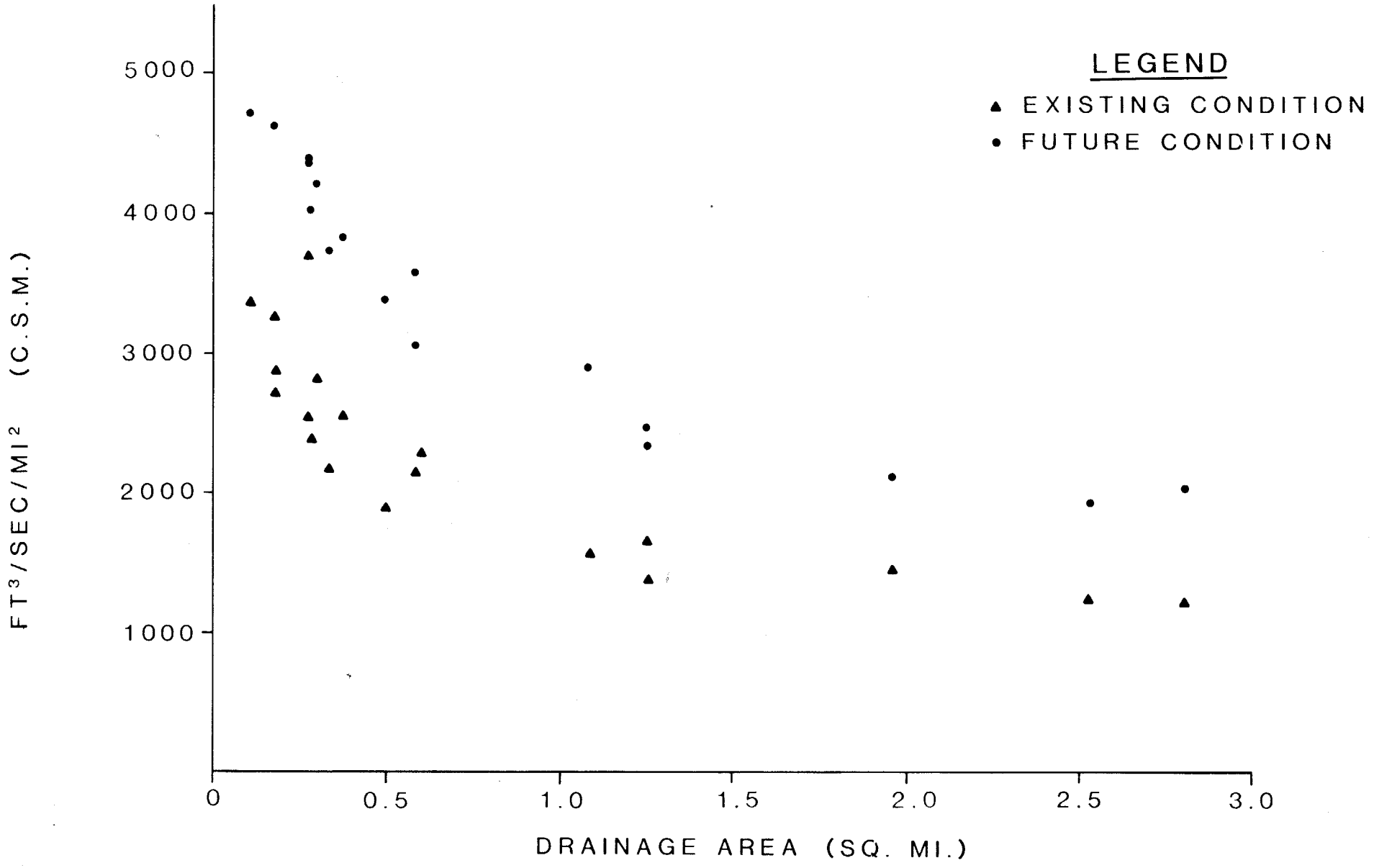
SAND AND GRAVEL PIT EMBANKMENT & SPILLWAY

N.T.S.

FIGURE 6

ANDERSON-NICHOLS & CO., INC.

027



HIGHLANDS WASH BASIN
100-YR. C.S.M. COMPARISON

FIGURE 7

ANDERSON-NICHOLS & CO., INC.

LEGEND

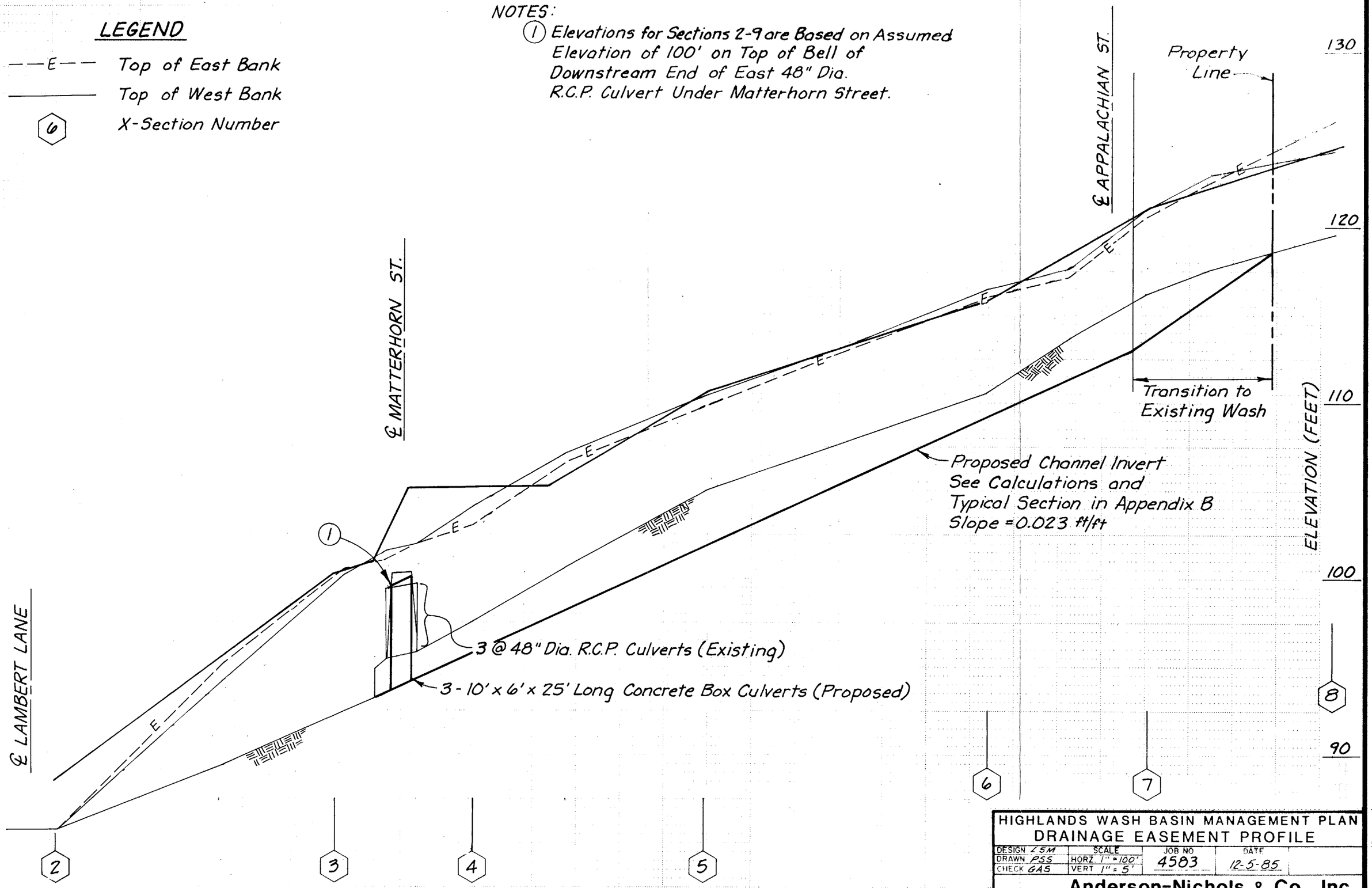
——E—— Top of East Bank

——— Top of West Bank

(6) X-Section Number

NOTES:

(1) Elevations for Sections 2-9 are Based on Assumed Elevation of 100' on Top of Bell of Downstream End of East 48" Dia. R.C.P. Culvert Under Matterhorn Street.



HIGHLANDS WASH BASIN MANAGEMENT PLAN			
DRAINAGE EASEMENT PROFILE			
DESIGN ZSM	SCALE	JOB NO	DATE
DRAWN PSS	HORZ 1" = 100'	4583	12-5-85
CHECK GAS	VERT 1" = 5'		

Anderson-Nichols & Co., Inc.
CONSULTING ENGINEERS
PHOENIX, ARIZONA

FIGURE 8

Appendix A

HIGHLANDS WASH VICINITY

TUCSON, ARIZONA

Return Period (Years)	Precipitation Values (inches)				
		6 Hour Duration		24 Hour Duration	
	1 HOUR	MAP VALUE	CORRECTED VALUE	MAP VALUE	CORRECTED VALUE
2	1.27	1.6	1.65	2.0	2.00
5	1.63	2.1	2.18	2.6	2.67
10	1.89	2.5	2.50	3.1	3.10
25	2.20	3.0	2.95	3.7	3.70
50	2.50	3.3	3.38	4.3	4.22
100	2.77	3.7	3.78	4.7	4.73

1 HOUR VALUES

2 year

$$y_2 = -0.011 + 0.942\ (1.65^2 / 2.00) = 1.27$$

100 year

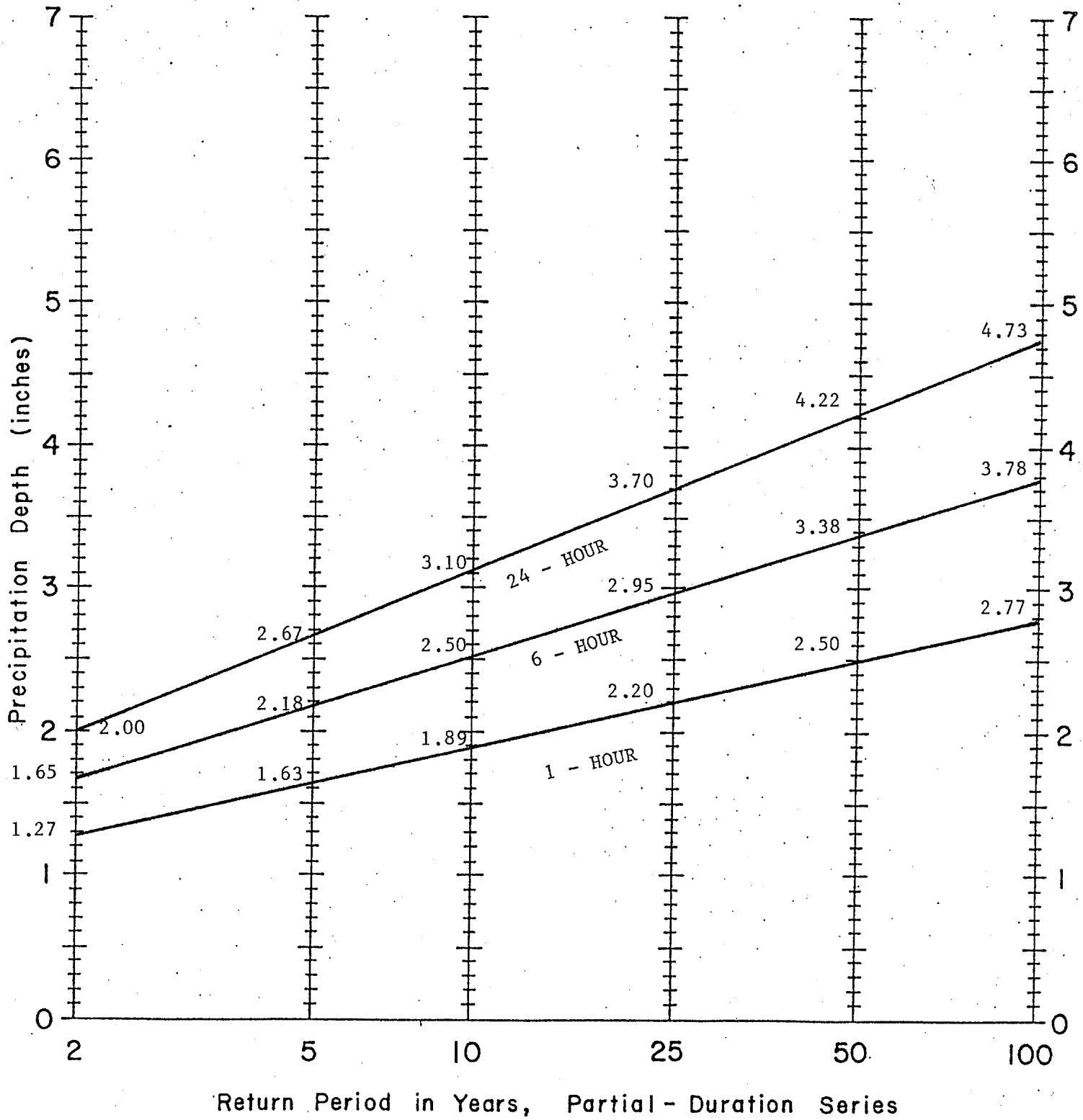
$$y_{100} = 0.494 + 0.755\ (3.78^2 / 4.73) = 2.77$$

031

Latitude 32° 25' Longitude 110° 58'

HIGHLANDS WASH VICINITY

TUCSON, ARIZONA



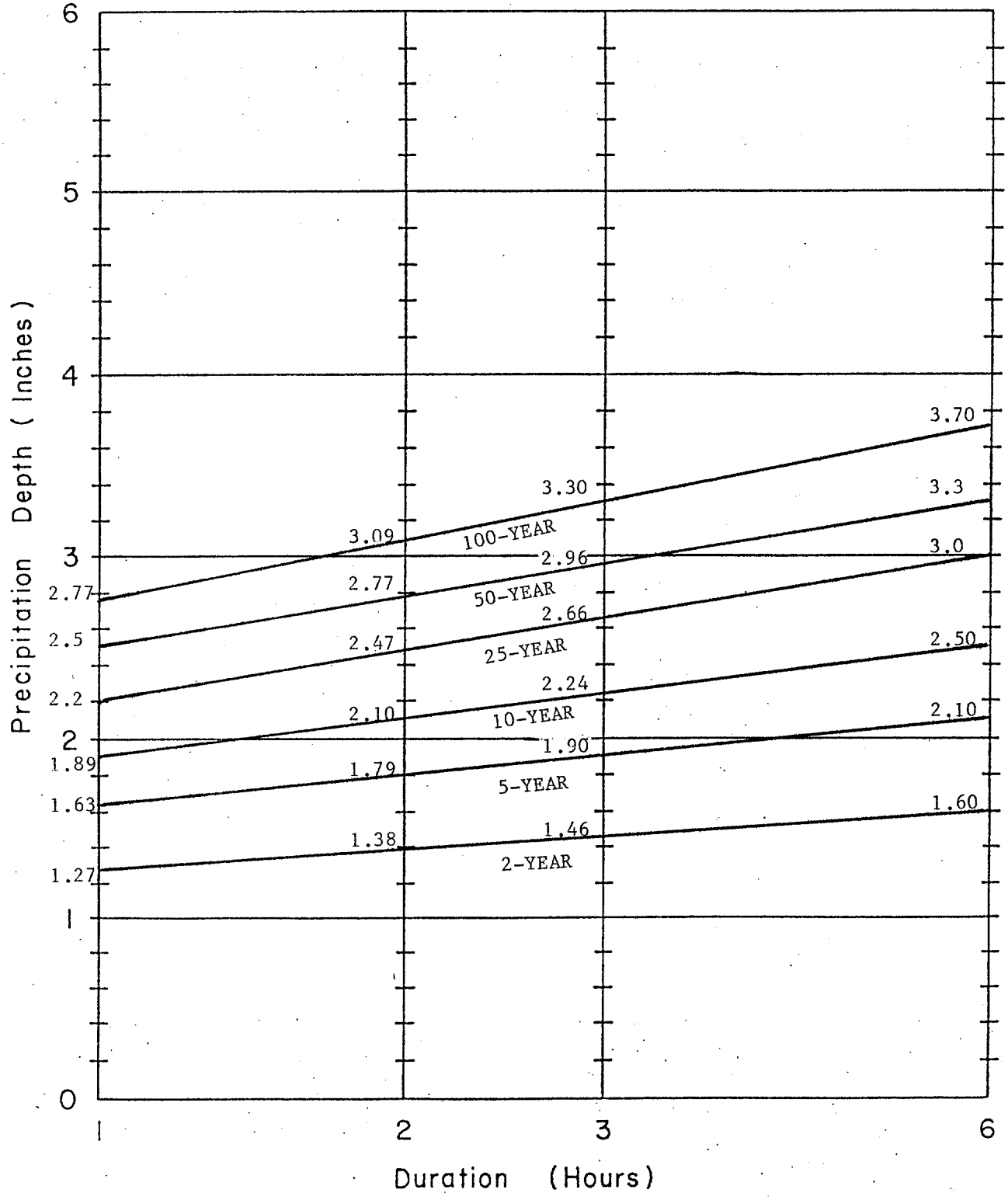
Precipitation Depth Versus Return Period For Partial - Duration Series

032

HIGHLANDS WASH AND VICINITY

TUCSON, ARIZONA

Precipitation Depth - Duration Diagram (1 - 6 Hours)



033

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~ square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.2, 91.1, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. = .6288 .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6288 i in./hr. (function of i)

Time of Concentration (T_c): 1.2065 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 44 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.41 in./hr.

Runoff Supply Rate (q) at T_c: 2.14 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1742 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

034

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~xacres~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89.0, 91.6
(curve number) (adjusted curve number)

Comp. C = .4469

Runoff to Rainfall Ratio(s),(C): .37, .50, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4468 i in./hr. (function of i)

Time of Concentration (T_c): 1.3832 $i^{-.4}$ hrs./~~mixxx~~ (function of i)

Iterative Solution of T_c: 1.11 hrs./~~mixxx~~

Rainfall Intensity (i) at T_c: 1.71 in./hr.

Runoff Supply Rate (q) at T_c: .77 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 623 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

035

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Comp. C = .3659

Runoff to Rainfall Ratio(s),(C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3659 i in./hr. (function of i)

Time of Concentration (T_c): 1.4983 $i^{-.4}$ hrs./~~minx~~ (function of i)

Iterative Solution of T_c: 1.38 hrs./~~minx~~

Rainfall Intensity (i) at T_c: 1.22 in./hr.

Runoff Supply Rate (q) at T_c: .45 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 364 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

036

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .2268 .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2268 i in./hr. (function of i)

Time of Concentration (T_c): 1.8140 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 2.1 hrs./~~min~~

Rainfall Intensity (i) at T_c: .66 in./hr.

Runoff Supply Rate (q) at T_c: .15 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 122 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

037

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.3 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5635 i in./hr. (function of i)

Time of Concentration (T_c): .3843 $i^{-.4}$ hrs. /~~xxxxx~~ (function of i)

Iterative Solution of T_c: 10 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 7.48 in./hr.

Runoff Supply Rate (q) at T_c: 4.21 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 490 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

038

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3687 i in./hr. (function of i)

Time of Concentration (T_c): .4553 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 15 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 4.31 in./hr.

Runoff Supply Rate (q) at T_c: 1.59 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 185 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

039

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2861 i in./hr. (function of i)

Time of Concentration (T_c): .5039 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 18 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 3.42 in./hr.

Runoff Supply Rate (q) at T_c: .98 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 114 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

040

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1519 i in./hr. (function of i)

Time of Concentration (T_c): .6492 $i^{-.4}$ hrs. ~~/xxxxx~~ (function of i)

Iterative Solution of T_c: 29 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.05 in./hr.

Runoff Supply Rate (q) at T_c: 0.31 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 36 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

041

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN^*(s): 87.2, 91.1, 93.3 (adjusted curve number)

Comp. C = .6401

Runoff to Rainfall Ratio(s), (C): .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6401 i in./hr. (function of i)

Time of Concentration (T_c): 1.0775 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 38 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.77 in./hr.

Runoff Supply Rate (q) at T_c: 2.41 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1681 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

042

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN^*(s): 84.6, 89.0, 91.6 (adjusted curve number)

Comp. C = .4603

Runoff to Rainfall Ratio(s), (C): .37, .50, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4603 i in./hr. (function of i)

Time of Concentration (T_c): 1.2294 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 56 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.98 in./hr.

Runoff Supply Rate (q) at T_c: 0.91 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 637 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

043

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .3797 .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3797 i in./hr. (function of i)

Time of Concentration (T_c): 1.3278 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 1.15 hrs./~~mins.~~

Rainfall Intensity (i) at T_c: 1.4383 in./hr.

Runoff Supply Rate (q) at T_c: 0.55 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 381 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

049

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Comp. C = .2398

Runoff to Rainfall Ratio(s), (C): .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2398 i in./hr. (function of i)

Time of Concentration (T_c): 1.5956 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 1.77 hrs./~~mins~~

Rainfall Intensity (i) at T_c: .77 in./hr.

Runoff Supply Rate (q) at T_c: .18 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 128 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

045

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~xxxx~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 87.3, 93.3
(curve number) (adjusted curve number)

Comp. C = .6037
Runoff to Rainfall Ratio(s),(C): .56, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6037 i in./hr. (function of i)

Time of Concentration (T_c): .7883 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 25 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 4.85 in./hr.

Runoff Supply Rate (q) at T_c: 2.93 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 944 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

046

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~acres~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft.

Incremental Change in Length (L_f) - ft.	Incremental Change in Elevation (H_f) - ft.
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (pervious & impervious areas) CN^*(s): 84.6, 91.6
(curve number) (adjusted curve number)

Comp. C = .4172

Runoff to Rainfall Ratio(s),(C): .37, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4172 i in./hr. (function of i)

Time of Concentration (T_c): 0.9139 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 37 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 2.61 in./hr.

Runoff Supply Rate (q) at T_c: 1.09 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 351 cfs.

Note: For impervious areas, $CN^* = 99$ (constant).

042

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~acres~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .3358
.29, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3358 i in./hr. (function of i)

Time of Concentration (T_c): 0.9968 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 45 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 1.99 in./hr.

Runoff Supply Rate (q) at T_c: 0.67 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 215 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

048

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~acres~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
500	40
3020	80
5100	95

Mean Slope (S_c): .0222 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): .035 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 80.5, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .15, .37 (pervious areas) .95 (impervious areas)
Comp. C = .1990

Runoff Supply Rate (q): .1990 i in./hr. (function of i)

Time of Concentration (T_c): 1.2289 $i^{-.4}$ hrs. ~~mins~~ (function of i)

Iterative Solution of T_c: 71 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 1.09 in./hr.

Runoff Supply Rate (q) at T_c: 0.22 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 70 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

049

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): .58 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.3, 91.1, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .6809 .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6809 i in./hr. (function of i)

Time of Concentration (T_c): .7938 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 25 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.85 in./hr.

Runoff Supply Rate (q) at T_c: 3.30 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1235 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

050

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 84.6, 89.0, 91.6
(curve number) (adjusted curve number)

Comp. C = .5090

Runoff to Rainfall Ratio(s),(C): .37, .50, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5090 i in./hr. (function of i)

Time of Concentration (T_c): 0.8917 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 36 ~~hrs./~~mins.

Rainfall Intensity (i) at T_c: 2.66 in./hr.

Runoff Supply Rate (q) at T_c: 1.36 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 508 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

057

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area To W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: _____ in.

P_6 (6 hour): 2.18 in. Areal Value: _____ in.

P_1 (1 hour): 1.63 in. Areal Value: _____ in.

P_2 (2 hour): 1.79 in. Areal Value: _____ in.

P_3 (3 hour): 1.90 in. Areal Value: _____ in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Comp. C = .4291

Runoff to Rainfall Ratio(s),(C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4291 i in./hr. (function of i)

Time of Concentration (T_c): 0.9547 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 43 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.04 in./hr.

Runoff Supply Rate (q) at T_c: 0.87 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 327 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

052

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .2860 .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2860 i in./hr. (function of i)

Time of Concentration (T_c): 1.1230 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 1 hrs./~~mins.~~

Rainfall Intensity (i) at T_c: 1.27 in./hr.

Runoff Supply Rate (q) at T_c: .36 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 136 cfs.

Note: For impervious areas, CN* = 99 (constant).

053

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~acres~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70
Use Lc = 6200	

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 87.3, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .6511 .56, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6511 i in./hr. (function of i)

Time of Concentration (T_c): .5693 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 17 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 5.98 in./hr.

Runoff Supply Rate (q) at T_c: 3.90 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 704 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 91.6 (adjusted curve number)

Comp. C = .4745

Runoff to Rainfall Ratio(s), (C): .37, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4745 i in./hr. (function of i)

Time of Concentration (T_c): .6461 $i^{-.4}$ hrs./~~xxxxx~~ (function of i)

Iterative Solution of T_c: 24 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 3.402 in./hr.

Runoff Supply Rate (q) at T_c: 1.61 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 292 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

055

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): 0.28 ~~acres~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .3944 .29, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3944 i in./hr. (function of i)

Time of Concentration (T_c): 0.6957 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 28 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.67 in./hr.

Runoff Supply Rate (q) at T_c: 1.05 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 191 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): 0.28 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN^*(s): 80.5, 89.0 (adjusted curve number)

Comp. C = .2546

Runoff to Rainfall Ratio(s),(C): .15, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2546 i in./hr. (function of i)

Time of Concentration (T_c): .8288 $i^{-.4}$ hrs./~~xxxxx~~ (function of i)

Iterative Solution of T_c: 41 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.64 in./hr.

Runoff Supply Rate (q) at T_c: 0.42 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 75 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

057

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 88, 91 (pervious & impervious areas) CN*(s): 91.1, 93.3
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .7055
.67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7055 i in./hr. (function of i)

Time of Concentration (T_c): .5431 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 16 ~~hrs/mins~~.

Rainfall Intensity (i) at T_c: 6.15 in./hr.

Runoff Supply Rate (q) at T_c: 4.34 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 840 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

052

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 88, 91 (curve number) (pervious & impervious areas) CN*(s): 89.0, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .49, .59 (pervious areas) .95 (impervious areas) Comp. C = .5371

Runoff Supply Rate (q): .5371 i in./hr. (function of i)

Time of Concentration (T_c): .6057 $i^{-.4}$ hrs. ~~mins~~. (function of i)

Iterative Solution of T_c: 22 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 3.57 in./hr.

Runoff Supply Rate (q) at T_c: 1.92 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 371 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

059

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.9, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .4577
.41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4577 i in./hr. (function of i)

Time of Concentration (T_c): .6457 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 26 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.79 in./hr.

Runoff Supply Rate (q) at T_c: 1.28 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 247 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

060

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 88, 91 (curve number) (pervious & impervious areas) CN*(s): 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .27, .37 Comp. C = .3118 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3118 i in./hr. (function of i)

Time of Concentration (T_c): .7529 $i^{-.4}$ hrs. ~~mins~~ (function of i)

Iterative Solution of T_c: 36 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 1.79 in./hr.

Runoff Supply Rate (q) at T_c: .56 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 108 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

061

100-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~acres~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 5% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 87.28, 91.05, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .6551 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6698 i in./hr. (function of i)

Time of Concentration (T_c): 1.4818 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 59 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.80 in./hr.

Runoff Supply Rate (q) at T_c: 1.87 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 3386 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

062

10-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: _____ in.

P_6 (6 hour): 2.50 in. Areal Value: _____ in.

P_1 (1 hour): 1.89 in. Areal Value: _____ in.

P_2 (2 hour): 2.10 in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 45% B, 12% C, 43%D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 5% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 89, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4787 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5023 i in./hr. (function of i)

Time of Concentration (T_c): 1.663 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 89 ~~xxx~~/mins.

Rainfall Intensity (i) at T_c: 1.33 in./hr.

Runoff Supply Rate (q) at T_c: .66 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 1204 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

063

5-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~acres~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 5% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3984 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .426 i in./hr. (function of i)

Time of Concentration (T_c): 1.776 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 107 ~~xxx~~/mins.

Rainfall Intensity (i) at T_c: .984 in./hr.

Runoff Supply Rate (q) at T_c: .4192 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 757 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

064

2-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~xxxx~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: _____ in.

P_6 (6 hour): 1.65 in. Areal Value: _____ in.

P_1 (1 hour): 1.27 in. Areal Value: _____ in.

P_2 (2 hour): 1.38 in. Areal Value: _____ in.

P_3 (3 hour): 1.46 in. Areal Value: _____ in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 5% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2578 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2924 i in./hr. (function of i)

Time of Concentration (T_c): 2.064 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 156 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: .5492 in./hr.

Runoff Supply Rate (q) at T_c: .1606 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 290 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

100-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff Between H-2 and H-1

Watershed Area (A): 0.27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	100

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): 45% Light-Moderate Urbanization 55% Desert Foothills (future)

Basin Factor (n_b): 0.0305 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour):	4.73 in.	Areal Value:	in.
P_6 (6 hour):	3.78 in.	Areal Value:	in.
P_1 (1 hour):	2.77 in.	Areal Value:	in.
P_2 (2 hour):	in.	Areal Value:	in.
P_3 (3 hour):	in.	Areal Value:	in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 25% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6601 i in./hr. (function of i)

Time of Concentration (T_c): .2792 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 7 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 8.73 in./hr.

Runoff Supply Rate (q) at T_c: 5.76 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1004 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

066

10-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): 0.27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	100

Mean Slope (S_c): .0432 ft./ft. Watershed Type(s): 45% Light to Moderate Urbanization 55% Desert Foothills (future)

Basin Factor (n_b): .0305 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 25% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5140 i in./hr. (function of i)

Time of Concentration (T_c): 0.3085 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 9 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 5.37 in./hr.

Runoff Supply Rate (q) at T_c: 2.76 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 481 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

062

5-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): 0.27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	100

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): 45% Light-Moderate Urbanization 55% Desert Foothills (future)

Basin Factor (n_b): 0.0305 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 25% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4521 i in./hr. (function of i)

Time of Concentration (T_c): 0.3248 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 11 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 4.25 in./hr.

Runoff Supply Rate (q) at T_c: 1.92 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 335 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

068

2-YEAR
EXISTING CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): 0.27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	100

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): 45% Light-Moderate Urbanization 55% Desert Foothills (future)

Basin Factor (n_b): .035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 25% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3514 i in./hr. (function of i)

Time of Concentration (T_c): .3592 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.01 in./hr.

Runoff Supply Rate (q) at T_c: 1.06 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 184 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

069

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 87.3, 91.1, 93.3
(curve number) (adjusted curve number)

Comp. C = .6635

Runoff to Rainfall Ratio(s), (C): .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6635 i in./hr. (function of i)

Time of Concentration (T_c): 1.4476 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 57 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.88 in./hr.

Runoff Supply Rate (q) at T_c: 1.91 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 3121 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

020

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89.0, 91.6
(curve number) (adjusted curve number)

Comp. C = .4886

Runoff to Rainfall Ratio(s),(C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4886 i in./hr. (function of i)

Time of Concentration (T_c): 1.6360 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 1.4 hrs./~~min~~

Rainfall Intensity (i) at T_c: 1.41 in./hr.

Runoff Supply Rate (q) at T_c: 0.69 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1125 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

071

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Comp. C = .4087

Runoff to Rainfall Ratio(s), (C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4087 i in./hr. (function of i)

Time of Concentration (T_c): 1.7571 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 1.8 hrs./~~min~~

Rainfall Intensity (i) at T_c: 0.98 in./hr.

Runoff Supply Rate (q) at T_c: 0.40 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 690 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

071a

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
2300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .2675
.15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2675 i in./hr. (function of i)

Time of Concentration (T_c): 2.0819 $i^{-.4}$ hrs./~~minxx~~ (function of i)

Iterative Solution of T_c: 2.7 ~~hrs./minxx~~

Rainfall Intensity (i) at T_c: .53 in./hr.

Runoff Supply Rate (q) at T_c: .14 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 232 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

072

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	80
5100	120

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 87.3, 93.3
(curve number) (adjusted curve number)

Comp. C = .5745

Runoff to Rainfall Ratio(s), (C): .56, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5745 i in./hr. (function of i)

Time of Concentration (T_c): .5627 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 16 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 6.15 in./hr.

Runoff Supply Rate (q) at T_c: 3.53 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1345 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

072a

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	80
5100	120

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .3819 .37, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3819 i in./hr. (function of i)

Time of Concentration (T_c): .6625 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 24 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 3.40 in./hr.

Runoff Supply Rate (q) at T_c: 1.30 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 495 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

023

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~xxxxs~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
1300	80
5100	120

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Comp. C = .2996

Runoff to Rainfall Ratio(s),(C): .29, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2996 i in./hr. (function of i)

Time of Concentration (T_c): 0.7300 $i^{-.4}$ hrs./~~xxxxx~~ (function of i)

Iterative Solution of T_c: 30 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.58 in./hr.

Runoff Supply Rate (q) at T_c: .77 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 294 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

074

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-2 and H-3

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
1300	80
5100	120

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 80.5, 89.0
(curve number) (adjusted curve number)

Comp. C = .1647

Runoff to Rainfall Ratio(s),(C): .15, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1647 i in./hr. (function of i)

Time of Concentration (T_c): .9274 $i^{-.4}$ hrs. ~~xxxxx~~ (function of i)

Iterative Solution of T_c: 47 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.50 in./hr.

Runoff Supply Rate (q) at T_c: 0.25 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 94 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

025

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.3, 91.1, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .6916
.56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6916 i in./hr. (function of i)

Time of Concentration (T_c): 1.2765 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 48 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.24 in./hr.

Runoff Supply Rate (q) at T_c: 2.24 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2806 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

076

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 84.6, 89.0, 91.6
(curve number) (adjusted curve number)

Comp. C = .5223

Runoff to Rainfall Ratio(s), (C): .37, .49, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5223 i in./hr. (function of i)

Time of Concentration (T_c): 1.4282 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 1.2 hrs./~~min~~

Rainfall Intensity (i) at T_c: 1.61 in./hr.

Runoff Supply Rate (q) at T_c: .84 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1053 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

077

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Comp. C = .4432

Runoff to Rainfall Ratio(s),(C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4432 i in./hr. (function of i)

Time of Concentration (T_c): 1.5252 $i^{-.4}$ hrs./~~mkmxx~~ (function of i)

Iterative Solution of T_c: 1.4 hrs./~~mkmxx~~

Rainfall Intensity (i) at T_c: 1.21 in./hr.

Runoff Supply Rate (q) at T_c: .54 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 671 cfs.

Note: For impervious areas, CN* = 99 (constant).

078

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Comp. C = .2999

Runoff to Rainfall Ratio(s), (C): .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2999 i in./hr. (function of i)

Time of Concentration (T_c): 1.7831 $i^{-.4}$ hrs./~~acres~~ (function of i)

Iterative Solution of T_c: 2.1 hrs./~~acres~~

Rainfall Intensity (i) at T_c: .66 in./hr.

Runoff Supply Rate (q) at T_c: .20 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 248 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

079

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88 (pervious & impervious areas) CN*(s): 87.3, 91.1
(curve number) (adjusted curve number)

Comp. C = .5798

Runoff to Rainfall Ratio(s), (C): .56, .67 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5798 i in./hr. (function of i)

Time of Concentration (T_c): .4652 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 13 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 6.76 in./hr.

Runoff Supply Rate (q) at T_c: 3.92 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 936 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

080

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88 (curve number) (pervious & impervious areas) CN^*(s): 84.6, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .3876 .37, .49 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3876 i in./hr. (function of i)

Time of Concentration (T_c): 0.5465 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 19 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 3.86 in./hr.

Runoff Supply Rate (q) at T_c: 1.49 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 357 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

081

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88 (pervious & impervious areas) CN*(s): 83.2, 87.9
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .3052
.29, .41 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3052 i in./hr. (function of i)

Time of Concentration (T_c): .6013 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 23 ~~hrs./~~mins.

Rainfall Intensity (i) at T_c: 2.99 in./hr.

Runoff Supply Rate (q) at T_c: .92 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 219 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

082

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8 (adjusted curve number)

Comp. C = .1693

Runoff to Rainfall Ratio(s),(C): .15, .27 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1693 i in./hr. (function of i)

Time of Concentration (T_c): .7613 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 36 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.79 in./hr.

Runoff Supply Rate (q) at T_c: .30 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 72 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

083

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 15% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.3, 91.1, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .7371
.56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7371 i in./hr. (function of i)

Time of Concentration (T_c): 1.1263 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 41 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 3.52 in./hr.

Runoff Supply Rate (q) at T_c: 2.59 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2075 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

084

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 89.0, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .5778 .37, .49, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5778 i in./hr. (function of i)

Time of Concentration (T_c): 1.2416 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 57 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.97 in./hr.

Runoff Supply Rate (q) at T_c: 1.14 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 909 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

085

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Comp. C = .5001

Runoff to Rainfall Ratio(s), (C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5001 i in./hr. (function of i)

Time of Concentration (T_c): 1.3154 $i^{-.4}$ hrs./~~minutes~~ (function of i)

Iterative Solution of T_c: 1.1 hrs./~~minutes~~

Rainfall Intensity (i) at T_c: 1.74 in./hr.

Runoff Supply Rate (q) at T_c: .87 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 695 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

086

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Comp. C = .3542

Runoff to Rainfall Ratio(s),(C): .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3542 i in./hr. (function of i)

Time of Concentration (T_c): 1.5099 $i^{-.4}$ hrs./~~min~~ (function of i)

Iterative Solution of T_c: 1.7 hrs./~~min~~

Rainfall Intensity (i) at T_c: .79 in./hr.

Runoff Supply Rate (q) at T_c: .28 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 225 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

087

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.3, 91.1, 93.3 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .6362 .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6362 i in./hr. (function of i)

Time of Concentration (T_c): .6878 $i^{-.4}$ hrs./~~mins~~hrs (function of i)

Iterative Solution of T_c: 21 ~~hrs~~x/mins.

Rainfall Intensity (i) at T_c: 5.35 in./hr.

Runoff Supply Rate (q) at T_c: 3.40 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 724 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN^*(s): 84.6, 89.0, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. C = .4536
.37, .49, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4536 i in./hr. (function of i)

Time of Concentration (T_c): 0.7874 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 31 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.91 in./hr.

Runoff Supply Rate (q) at T_c: 1.32 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 281 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

089

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Comp. C = .3724

Runoff to Rainfall Ratio(s), (C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3724 i in./hr. (function of i)

Time of Concentration (T_c): .8522 $i^{-.4}$ hrs./~~max~~ (function of i)

Iterative Solution of T_c: 37 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.25 in./hr.

Runoff Supply Rate (q) at T_c: .84 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 178 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

090

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Comp. C = .2311

Runoff to Rainfall Ratio(s), (C): .15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2311 i in./hr. (function of i)

Time of Concentration (T_c): 1.0312 $i^{-.4}$ hrs. ~~xxxxx~~ (function of i)

Iterative Solution of T_c: 55 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.35 in./hr.

Runoff Supply Rate (q) at T_c: .31 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 66 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

091

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Desert Foothills (existing) ~~(future)~~

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: N/A in.

P_6 (6 hour): 3.78 in. Areal Value: N/A in.

P_1 (1 hour): 2.77 in. Areal Value: N/A in.

P_2 (2 hour): 3.09 in. Areal Value: N/A in.

P_3 (3 hour): 3.30 in. Areal Value: N/A in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5635 i in./hr. (function of i)

Time of Concentration (T_c): .5057 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 6.56 in./hr.

Runoff Supply Rate (q) at T_c: 3.70 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 692 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

092

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Desert Foothills existing (~~future~~)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: N/A in.

P_6 (6 hour): 2.50 in. Areal Value: N/A in.

P_1 (1 hour): 1.89 in. Areal Value: N/A in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 84.62 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3687 i in./hr. (function of i)

Time of Concentration (T_c): .5992 $i^{-.4}$ hrs. ~~/xxxxx~~ (function of i)

Iterative Solution of T_c: 21 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 3.65 in./hr.

Runoff Supply Rate (q) at T_c: 1.35 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 252 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

093

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft

Incremental Change in Length (L_f) - ft.	Incremental Change in Elevation (H_f) - ft
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Desert Foothills (existing) ~~(future)~~

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: N/A in.

P_6 (6 hour): 2.18 in. Areal Value: N/A in.

P_1 (1 hour): 1.63 in. Areal Value: N/A in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.28 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2861 i in./hr. (function of i)

Time of Concentration (T_c): .6632 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 26 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.79 in./hr.

Runoff Supply Rate (q) at T_c: 0.80 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 149 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

094

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Desert Foothills (existing) ~~(future)~~

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: N/A in.

P_6 (6 hour): 1.65 in. Areal Value: N/A in.

P_1 (1 hour): 1.27 in. Areal Value: N/A in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 80.53 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1519 i in./hr. (function of i)

Time of Concentration (T_c): .8544 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 42 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 1.61 in./hr.

Runoff Supply Rate (q) at T_c: 0.24 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 46 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

095

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Desert Foothills existing (~~future~~)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.3 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5635 i in./hr. (function of i)

Time of Concentration (T_c): .3562 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 9 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 7.87 in./hr.

Runoff Supply Rate (q) at T_c: 4.43 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 515 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

096

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3687 i in./hr. (function of i)

Time of Concentration (T_c): .4220 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.48 in./hr.

Runoff Supply Rate (q) at T_c: 1.65 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 192 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

097

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .29 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2861 i in./hr. (function of i)

Time of Concentration (T_c): .4671 $i^{-.4}$ hrs./~~mins~~x (function of i)

Iterative Solution of T_c: 17 ~~hrs~~x/mins.

Rainfall Intensity (i) at T_c: 3.52 in./hr.

Runoff Supply Rate (q) at T_c: 1.01 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 117 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

098

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0042 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1519 i in./hr. (function of i)

Time of Concentration (T_c): .6017 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 27 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.13 in./hr.

Runoff Supply Rate (q) at T_c: .32 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 38 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

099

HYDROLOGIC DATA SHEET

100-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): 3.09 in. Areal Value: _____ in.

P_3 (3 hour): 3.30 in. Areal Value: _____ in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 87.3 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5635 i in./hr. (function of i)

Time of Concentration (T_c): .2349 $i^{-.4}$ hrs. ~~/mins.~~ (function of i)

Iterative Solution of T_c: 6 ~~hrs./~~mins.

Rainfall Intensity (i) at T_c: 9.20 in./hr.

Runoff Supply Rate (q) at T_c: 5.18 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 368 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

100

HYDROLOGIC DATA SHEET

10-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): 2.10 in. Areal Value: in.

P_3 (3 hour): 2.24 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3687 i in./hr. (function of i)

Time of Concentration (T_c): .2784 $i^{-.4}$ hrs. ~~mins.~~ (function of i)

Iterative Solution of T_c: 8 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 5.65 in./hr.

Runoff Supply Rate (q) at T_c: 2.08 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 148 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): 1.79 in. Areal Value: in.

P_3 (3 hour): 1.90 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .2861 i in./hr. (function of i)

Time of Concentration (T_c): .3081 $i^{-.4}$ hrs./~~xxxx~~ (function of i)

Iterative Solution of T_c: 10 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 4.40 in./hr.

Runoff Supply Rate (q) at T_c: 1.26 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 89 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

2-YEAR
EXISTING CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Desert Foothills (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 0% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .1519 i in./hr. (function of i)

Time of Concentration (T_c): .3969 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 16 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.82 in./hr.

Runoff Supply Rate (q) at T_c: .43 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 30 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 59% B; 13% C; 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 45% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 87.2, 91.1, 93.3
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. C = .6288
.56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7733 i in./hr. (function of i)

Time of Concentration (T_c): .7616 $i^{-.4}$ hrs./~~mins~~. (function of i)

Iterative Solution of T_c: 24 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 4.99 in./hr.

Runoff Supply Rate (q) at T_c: 3.86 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 3135 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~ square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 45% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Comp. = .4469
Runoff to Rainfall Ratio(s), (C): .37, .50, .59 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6733 i in./hr. (function of i)

Time of Concentration (T_c): .8050 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 32 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.85 in./hr.

Runoff Supply Rate (q) at T_c: 1.92 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1562 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 28% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 45% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Comp. = .3659

Runoff to Rainfall Ratio(s), (C): .29, .41, .51 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6287 i in./hr. (function of i)

Time of Concentration (T_c): .8273 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 35 ~~secs~~/mins.

Rainfall Intensity (i) at T_c: 2.33 in./hr.

Runoff Supply Rate (q) at T_c: 1.47 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1192 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Cumulative Drainage Area to W-1

Watershed Area (A): 1.26 ~~acres~~/square miles.

Length of Watercourse (L_c): 19680 ft. Length to Center of Gravity (L_{ca}): 9000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
3000	40
7500	240

Mean Slope (S_c): 0.0198 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 59% B, 13% C, 78% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 45% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. = .2268
.15, .27, .37 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5523 i in./hr. (function of i)

Time of Concentration (T_c): .8714 $i^{-.4}$ hrs./~~xxxx~~ (function of i)

Iterative Solution of T_c: 44 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.56 in./hr.

Runoff Supply Rate (q) at T_c: .86 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 702 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Suburban - Foothills (future)

Basin Factor (n_b): .034 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 20% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6408 i in./hr. (function of i)

Time of Concentration (T_c): .3546 $i^{-.4}$ hrs./~~mins~~x (function of i)

Iterative Solution of T_c: 9 ~~mins~~x/mins.

Rainfall Intensity (i) at T_c: 7.87 in./hr.

Runoff Supply Rate (q) at T_c: 5.04 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 586 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Suburban - Foothills (future)

Basin Factor (n_b): 0.034 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 20% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4850 i in./hr. (function of i)

Time of Concentration (T_c): .3964 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 13 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.61 in./hr.

Runoff Supply Rate (q) at T_c: 2.24 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 260 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Suburban - Foothills (future)

Basin Factor (n_b): 0.034 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 20% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4189 i in./hr. (function of i)

Time of Concentration (T_c): .4203 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 15 ~~mins.~~/mins.

Rainfall Intensity (i) at T_c: 3.72 in./hr.

Runoff Supply Rate (q) at T_c: 1.56 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 181 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-1 Local runoff between W-2 and W-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
950	40
2950	80

Mean Slope (S_c): 0.0299 ft./ft. Watershed Type(s): Suburban - Foothills (future)

Basin Factor (n_b): 0.034 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 13 Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 20% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .3115 i in./hr. (function of i)

Time of Concentration (T_c): .4731 $i^{-.4}$ hrs. ~~mins~~ (function of i)

Iterative Solution of T_c: 19 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.59 in./hr.

Runoff Supply Rate (q) at T_c: .81 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 94 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

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HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Light to Moderate Urban. (future)

Basin Factor (n_b): .022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 87.2, 91.1, 93.3
(curve number) (adjusted curve number)

Comp. C = .6401

Runoff to Rainfall Ratio(s),(C): .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7950 i in./hr. (function of i)

Time of Concentration (T_c): .6210 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 19 ~~hrs/~~mins.

Rainfall Intensity (i) at T_c: 5.65 in./hr.

Runoff Supply Rate (q) at T_c: 4.49 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 3131 cfs.

Note: For impervious areas, $CN^* = 99$ (constant).

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HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~x acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 89, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4604 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7052 i in./hr. (function of i)

Time of Concentration (T_c): .6515 $i^{-.4}$ hrs. ~~/max~~ (function of i)

Iterative Solution of T_c: 24 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.40 in./hr.

Runoff Supply Rate (q) at T_c: 2.40 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1672 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3797 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6648 i in./hr. (function of i)

Time of Concentration (T_c): .6671 $i^{-.4}$ hrs./~~xxxx~~ (function of i)

Iterative Solution of T_c: 27 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.74 in./hr.

Runoff Supply Rate (q) at T_c: 1.82 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1269 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Cumulative Drainage Area to W-2

Watershed Area (A): 1.08 ~~acres~~/square miles.

Length of Watercourse (L_c): 14680 ft. Length to Center of Gravity (L_{ca}): 7080 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
9180	150
5500	105

Mean Slope (S_c): 0.0173 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 15% C, 33% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2398 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5949 i in./hr. (function of i)

Time of Concentration (T_c): .6974 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 32 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.92 in./hr.

Runoff Supply Rate (q) at T_c: 1.14 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 795 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~acres~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0223 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): 3.09 in. Areal Value: _____ in.

P_3 (3 hour): 3.30 in. Areal Value: _____ in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 87.28, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .6037 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7734 i in./hr. (function of i)

Time of Concentration (T_c): .4549 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 13 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 6.76 in./hr.

Runoff Supply Rate (q) at T_c: 5.23 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 1687 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~acres~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0223 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: _____ in.

P_6 (6 hour): 2.50 in. Areal Value: _____ in.

P_1 (1 hour): 1.89 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 84.6, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4172 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6783 i in./hr. (function of i)

Time of Concentration (T_c): .4794 $i^{-.4}$ hrs./~~mins~~. (function of i)

Iterative Solution of T_c: 16 ~~hours~~/mins.

Rainfall Intensity (i) at T_c: 4.20 in./hr.

Runoff Supply Rate (q) at T_c: 2.85 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 918 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 acres/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0223 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: _____ in.

P_6 (6 hour): 2.18 in. Areal Value: _____ in.

P_1 (1 hour): 1.63 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3358 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6367 i in./hr. (function of i)

Time of Concentration (T_c): .4917 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 18 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.42 in./hr.

Runoff Supply Rate (q) at T_c: 2.18 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 703 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

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HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-2 Local runoff between W-3 and W-2

Watershed Area (A): 0.50 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 5500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
500	40
3020	80
5100	95

Mean Slope (S_c): 0.0222 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0223 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: _____ in.

P_6 (6 hour): 1.65 in. Areal Value: _____ in.

P_1 (1 hour): 1.27 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 78% B, 22% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 80.5, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1990 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5670 i in./hr. (function of i)

Time of Concentration (T_c): .5150 $i^{-.4}$ hrs. ~~xxxxx~~ (function of i)

Iterative Solution of T_c: 22 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.40 in./hr.

Runoff Supply Rate (q) at T_c: 1.36 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 439 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): .022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): 3.09 in. Areal Value: _____ in.

P_3 (3 hour): 3.30 in. Areal Value: _____ in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 51% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35 (adjusted curve number)

Comp. C = .6809

Runoff to Rainfall Ratio(s),(C): .56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .8181 i in./hr. (function of i)

Time of Concentration (T_c): 0.4636 $i^{-.4}$ hrs. ~~xxxxx~~ (function of i)

Iterative Solution of T_c: 13 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 6.76 in./hr.

Runoff Supply Rate (q) at T_c: 5.53 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 2070 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

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HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: _____ in.

P_6 (6 hour): 2.50 in. Areal Value: _____ in.

P_1 (1 hour): 1.89 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 51% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5090 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7339 i in./hr. (function of i)

Time of Concentration (T_c): .4842 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 16 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 4.20 in./hr.

Runoff Supply Rate (q) at T_c: 3.08 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 1153 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 51% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4291 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6948 i in./hr. (function of i)

Time of Concentration (T_c): .4949 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 18 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.4 in./hr.

Runoff Supply Rate (q) at T_c: 2.38 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 890 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Cumulative Drainage Area to W-3

Watershed Area (A): 0.58 ~~acres~~/square miles.

Length of Watercourse (L_c): 9180 ft. Length to Center of Gravity (L_{ca}): 4000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
9180	150

Mean Slope (S_c): 0.016 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 24% B, 29% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 51% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2860 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6246 i in./hr. (function of i)

Time of Concentration (T_c): .5164 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 22 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.40 in./hr.

Runoff Supply Rate (q) at T_c: 1.50 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 561 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0215 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 54% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN^*(s): 87.28, 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .6511 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .8125 i in./hr. (function of i)

Time of Concentration (T_c): .3201 $i^{-.4}$ hrs./~~xxxx~~ (function of i)

Iterative Solution of T_c: 8 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 8.28 in./hr.

Runoff Supply Rate (q) at T_c: 6.73 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1216 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~acres~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0215 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 54% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .4745 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7313 i in./hr. (function of i)

Time of Concentration (T_c): .3338 $i^{-.4}$ hrs./~~mins~~x (function of i)

Iterative Solution of T_c: 11 ~~hrs~~x/mins.

Rainfall Intensity (i) at T_c: 4.93 in./hr.

Runoff Supply Rate (q) at T_c: 3.61 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 652 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~acres~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0215 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 54% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3944 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6944 i in./hr. (function of i)

Time of Concentration (T_c): .3408 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 12 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.11 in./hr.

Runoff Supply Rate (q) at T_c: 2.85 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 515 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-3 Local runoff between W-4 and W-3

Watershed Area (A): .28 ~~acres~~/square miles.

Length of Watercourse (L_c): 5980 ft. Length to Center of Gravity (L_{ca}): 2780 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	80
4200	70

Mean Slope (S_c): 0.0212 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.0215 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 52% B, 48% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 54% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2546 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6301 i in./hr. (function of i)

Time of Concentration (T_c): .3543 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.01 in./hr.

Runoff Supply Rate (q) at T_c: 1.90 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 343 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

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HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): 3.09 in. Areal Value: _____ in.

P_3 (3 hour): 3.30 in. Areal Value: _____ in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 88, 91 (pervious & impervious areas) CN*(s): 91.05, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. = .7055
.67, .75 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .8253 i in./hr. (function of i)

Time of Concentration (T_c): .3352 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 9 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 7.87 in./hr.

Runoff Supply Rate (q) at T_c: 6.49 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 1257 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 88, 91 (curve number) (pervious & impervious areas) CN*(s): 89, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5377 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7397 i in./hr. (function of i)

Time of Concentration (T_c): .3502 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 11 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.93 in./hr.

Runoff Supply Rate (q) at T_c: 3.65 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 706 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 88, 91 (pervious & impervious areas) CN^*(s): 87.9, 90.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .4577 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6989 i in./hr. (function of i)

Time of Concentration (T_c): .3582 $i^{-.4}$ hrs. ~~/mins~~ (function of i)

Iterative Solution of T_c: 12 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 4.11 in./hr.

Runoff Supply Rate (q) at T_c: 2.87 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 556 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

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HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: W-4 Local runoff

Watershed Area (A): 0.30 ~~acres~~/square miles.

Length of Watercourse (L_c): 4980 ft. Length to Center of Gravity (L_{ca}): 2200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4980	80

Mean Slope (S_c): 0.0161 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 55% C, 45% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 49% (future)

CN(s): 88, 91 (curve number) (pervious & impervious areas) CN*(s): 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3118 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6245 i in./hr. (function of i)

Time of Concentration (T_c): .3747 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 15 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.90 in./hr.

Runoff Supply Rate (q) at T_c: 1.81 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 350 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

100-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~acres~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Light Urbanization (future)

Basin Factor (n_b): 0.026 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: _____ in.

P_6 (6 hour): 3.78 in. Areal Value: _____ in.

P_1 (1 hour): 2.77 in. Areal Value: _____ in.

P_2 (2 hour): 3.09 in. Areal Value: _____ in.

P_3 (3 hour): 3.30 in. Areal Value: _____ in.

Soil Group(s): 45% B 12% C 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: .35 (future)

CN(s): 83 88 91 (curve number) (pervious & impervious areas) CN^*(s): 87.28 91.05 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .6551 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7583 i in./hr. (function of i)

Time of Concentration (T_c): 0.9783 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 33 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.10 in./hr.

Runoff Supply Rate (q) at T_c: 3.11 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 5617 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

10-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~acres~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Light Urbanization (future)

Basin Factor (n_b): 0.026 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: .35 (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4787 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6437 i in./hr. (function of i)

Time of Concentration (T_c): 1.0446 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 45 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.31 in./hr.

Runoff Supply Rate (q) at T_c: 1.48 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2682 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

5-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.8 acres/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Light Urbanization (future)

Basin Factor (n_b): 0.026 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: _____ in.

P_6 (6 hour): 2.18 in. Areal Value: _____ in.

P_1 (1 hour): 1.63 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: .35 (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3984 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5915 i in./hr. (function of i)

Time of Concentration (T_c): 1.0805 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 51 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.83 in./hr.

Runoff Supply Rate (q) at T_c: 1.08 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 1950 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

2-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Cumulative Drainage Area to H-1

Watershed Area (A): 2.80 ~~acres~~/square miles.

Length of Watercourse (L_c): 29,900 ft. Length to Center of Gravity (L_{ca}): 13,200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22,300	360
4000	180

Mean Slope (S_c): 0.0197 ft./ft. Watershed Type(s): Light Urbanization (future)

Basin Factor (n_b): 0.026 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 45% B, 12% C, 43% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: .35 (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2578 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5000 i in./hr. (function of i)

Time of Concentration (T_c): 1.156 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 62 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 1.25 in./hr.

Runoff Supply Rate (q) at T_c: 0.625 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1129 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

100-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): 0.27 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
400	40
1000	40
2500	100

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 35% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6988 i in./hr. (function of i)

Time of Concentration (T_c): .2147 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 5 hrs./~~xxxxx~~

Rainfall Intensity (i) at T_c: 9.64 in./hr.

Runoff Supply Rate (q) at T_c: 6.74 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1174 cfs.

Note: For impervious areas, CN* = 99 (constant).

10-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): .27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	100

Mean Slope (S_c): .0432 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): .024 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.87 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 35% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5722 i in./hr. (function of i)

Time of Concentration (T_c): .2326 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 7 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 5.89 in./hr.

Runoff Supply Rate (q) at T_c: 3.37 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 587 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

5-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): .27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
400	40
1000	40
2500	1000

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 35% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.5185 i in./hr. (function of i)

Time of Concentration (T_c): 0.2419 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 8 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 4.87 in./hr.

Runoff Supply Rate (q) at T_c: 2.53 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 440 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

2-YEAR
FUTURE CONDITION

HYDROLOGIC DATA SHEET

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, NORTH TUCSON, ARIZONA

Drainage Concentration Point: H-1 Local Runoff between H-2 and H-1

Watershed Area (A): 0.27 ~~acres~~/square miles.

Length of Watercourse (L_c): 3900 ft. Length to Center of Gravity (L_{ca}): 1650 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
400	40
1000	40
2500	100

Mean Slope (S_c): 0.0432 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 35% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4117 i in./hr. (function of i)

Time of Concentration (T_c): .2653 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 10 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.43 in./hr.

Runoff Supply Rate (q) at T_c: 1.41 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 246 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): .0267 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 37% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN^*(s): 87.28, 91.05, 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. = .6635
.56, .67, .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7695 i in./hr. (function of i)

Time of Concentration (T_c): 1.041 $i^{-.4}$ hrs. ~~/mins.~~ (function of i)

Iterative Solution of T_c: 36 hrs. ~~/mins.~~

Rainfall Intensity (i) at T_c: 3.91 in./hr.

Runoff Supply Rate (q) at T_c: 3.00 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 4907 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): 0.0267 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 37% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4888 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6594 i in./hr. (function of i)

Time of Concentration (T_c): 1.1070 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 49 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.17 in./hr.

Runoff Supply Rate (q) at T_c: 1.43 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2340 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): 0.0267 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 37% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .4087 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6090 i in./hr. (function of i)

Time of Concentration (T_c): 1.1428 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 55 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 1.73 in./hr.

Runoff Supply Rate (q) at T_c: 1.05 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1718 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Cumulative Drainage Area to H-2

Watershed Area (A): 2.53 ~~acres~~/square miles.

Length of Watercourse (L_c): 25900 ft. Length to Center of Gravity (L_{ca}): 11700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
22300	360

Mean Slope (S_c): 0.0178 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): 0.0267 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): 1.38 in. Areal Value: in.

P_3 (3 hour): 1.46 in. Areal Value: in.

Soil Group(s): 40% B, 13% C, 47% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 37% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2675 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5200 i in./hr. (function of i)

Time of Concentration (T_c): 1.2173 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 70 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.10 in./hr.

Runoff Supply Rate (q) at T_c: .57 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 938 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	80
5100	120

Mean Slope (S_c): .0277 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): .031 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 34% (future)

CN(s): 83, 91 (pervious & impervious areas) CN^*(s): 87.28, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): Comp. = .5745
0.56 / .74 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7021 i in./hr. (function of i)

Time of Concentration (T_c): .4599 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 13 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 6.76 in./hr.

Runoff Supply Rate (q) at T_c: 4.75 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1807 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	80
5100	120

Mean Slope (S_c): .0277 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): .031 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 34% (future)

CN(s): 83, 91 (pervious & impervious areas) CN*(s): 84.6, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. = .3819
.3687, .4954, .5891 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5751 i in./hr. (function of i)

Time of Concentration (T_c): .4982 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.48 in./hr.

Runoff Supply Rate (q) at T_c: 2.58 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 981 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
1300	80
5100	120

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): .031 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: _____ in.

P_6 (6 hour): 2.18 in. Areal Value: _____ in.

P_1 (1 hour): 1.63 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 34% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): Comp. = .2996
.2861, .4135, .5118 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.5208 i in./hr. (function of i)

Time of Concentration (T_c): 0.5183 $i^{-.4}$ hrs./~~xxxxx~~ (function of i)

Iterative Solution of T_c: 19 ~~xxx~~./mins.

Rainfall Intensity (i) at T_c: 3.33 in./hr.

Runoff Supply Rate (q) at T_c: 1.73 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 659 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-2 Local runoff between H-3 and H-2

Watershed Area (A): 0.59 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 3020 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	80
5100	120

Mean Slope (S_c): .0277 ft./ft. Watershed Type(s): Suburban - Valley (future)

Basin Factor (n_b): .031 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 94% B, 6% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 34% (future)

CN(s): 83, 91 (curve number) (pervious & impervious areas) CN*(s): 80.5, 89.0 (adjusted curve number)

Comp. = .1647

Runoff to Rainfall Ratio(s),(C): .1519, .2676, .3658 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4317 i in./hr. (function of i)

Time of Concentration (T_c): .5587 $i^{-.4}$ hrs. ~~/mins~~. (function of i)

Iterative Solution of T_c: 24 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 2.29 in./hr.

Runoff Supply Rate (q) at T_c: .97 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 376 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Developed-Suburban Valley(future)

Basin Factor (n_b): .027 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .6916 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7846 i in./hr. (function of i)

Time of Concentration (T_c): 0.9363 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 32 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 4.18 in./hr.

Runoff Supply Rate (q) at T_c: 3.28 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 4109 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

A-120

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.027 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5225 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6764 i in./hr. (function of i)

Time of Concentration (T_c): 0.9936 $i^{-.4}$ hrs./~~min~~hr (function of i)

Iterative Solution of T_c: 42 hrs./~~min~~hr

Rainfall Intensity (i) at T_c: 2.40 in./hr.

Runoff Supply Rate (q) at T_c: 1.62 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2033 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumalative Drainage Area to H-3

Watershed Area (A): 1.94 ~~acres~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.027 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN^*(s): 83.2, 87.9, 90.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .4432 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6256 i in./hr. (function of i)

Time of Concentration (T_c): 1.0251 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 47 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.92 in./hr.

Runoff Supply Rate (q) at T_c: 1.20 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1507 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Cumulative Drainage Area to H-3

Watershed Area (A): 1.94 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 20200 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
900	80
2700	80
16600	240

Mean Slope (S_c): 0.0166 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.027 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 23% B, 17% C, 60% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3000 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5339 i in./hr. (function of i)

Time of Concentration (T_c): 1.0921 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 59 ~~xxxxx~~/mins.

Rainfall Intensity (i) at T_c: 1.28 in./hr.

Runoff Supply Rate (q) at T_c: 0.68 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 857 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): .0271 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): .0248 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88 (curve number) (pervious & impervious areas) CN*(s): 87.28, 91.05 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5798 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7131 i in./hr. (function of i)

Time of Concentration (T_c): .3034 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 8 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 8.28 in./hr.

Runoff Supply Rate (q) at T_c: 5.91 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1410 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.0248 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88 (pervious & impervious areas) CN^*(s): 84.6, 89
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3877 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5901 i in./hr. (function of i)

Time of Concentration (T_c): .3273 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 10 ~~hours~~/mins.

Rainfall Intensity (i) at T_c: 5.10 in./hr.

Runoff Supply Rate (q) at T_c: 3.01 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 719 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-3 and H-4

Watershed Area (A): 0.37 ~~acres~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.0248 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88 (curve number) (pervious & impervious areas) CN^*(s): 83.2, 87.9 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3052 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5373 i in./hr. (function of i)

Time of Concentration (T_c): .3398 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 12 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.11 in./hr.

Runoff Supply Rate (q) at T_c: 2.21 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 527 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-3 Local runoff between H-4 and H-3

Watershed Area (A): 0.37 ~~xxxxxx~~/square miles.

Length of Watercourse (L_c): 4200 ft. Length to Center of Gravity (L_{ca}): 2400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1850	80
2400	50

Mean Slope (S_c): 0.0271 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.0248 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 85% B, 15% C Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 36% (future)

CN(s): 83, 88 (pervious & impervious areas) CN*(s): 80.5, 85.8
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .1693 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .4503 i in./hr. (function of i)

Time of Concentration (T_c): .3647 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.01 in./hr.

Runoff Supply Rate (q) at T_c: 1.355 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 324 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): .028 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 30% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .7371 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.8010 i in./hr. (function of i)

Time of Concentration (T_c): .8716 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 29 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.46 in./hr.

Runoff Supply Rate (q) at T_c: 3.57 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 2859 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.028 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 30% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 84.6, 89, 91.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5778 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6895 i in./hr. (function of i)

Time of Concentration (T_c): .9254 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 38 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.57 in./hr.

Runoff Supply Rate (q) at T_c: 1.77 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1418 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 30% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5001 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6350 i in./hr. (function of i)

Time of Concentration (T_c): .9564 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 43 ~~mins~~/mins.

Rainfall Intensity (i) at T_c: 2.04 in./hr.

Runoff Supply Rate (q) at T_c: 1.29 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1035 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-4 Local runoff

Watershed Area (A): 1.24 ~~acres~~/square miles.

Length of Watercourse (L_c): 14600 ft. Length to Center of Gravity (L_{ca}): 9200 ft.

Incremental Change in Length (L_t) - ft.	Incremental Change in Elevation (H_t) - ft.
11000	145
2700	80
900	80

Mean Slope (S_c): 0.0163 ft./ft. Watershed Type(s): Developed Suburban Valley (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 1.5% B, 8.5% C, 90% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 30% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3542 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5330 i in./hr. (function of i)

Time of Concentration (T_c): 1.0258 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 54 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 1.37 in./hr.

Runoff Supply Rate (q) at T_c: .7310 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 585 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Highly Urbanized (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 44% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 87.28, 91.05, 93.35
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .6362 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .7742 i in./hr. (function of i)

Time of Concentration (T_c): .3633 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 10 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 7.48 in./hr.

Runoff Supply Rate (q) at T_c: 5.79 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1233 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Highly Urbanized (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 10 yrs

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 44% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 84.6, 89, 91.6
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .4541 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6723 i in./hr. (function of i)

Time of Concentration (T_c): .3845 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 12 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.76 in./hr.

Runoff Supply Rate (q) at T_c: 3.20 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 682 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Highly Urbanized (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 44% (future)

CN(s): 83, 88, 91 (curve number) (pervious & impervious areas) CN*(s): 83.2, 87.9, 90.8 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3724 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6265 i in./hr. (function of i)

Time of Concentration (T_c): .3955 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 14 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.86 in./hr.

Runoff Supply Rate (q) at T_c: 2.42 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 515 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: H-5 Local runoff

Watershed Area (A): 0.33 ~~acres~~/square miles.

Length of Watercourse (L_c): 6600 ft. Length to Center of Gravity (L_{ca}): 3100 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4800	80
1800	25

Mean Slope (S_c): 0.0158 ft./ft. Watershed Type(s): Highly Urbanized (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): 40% B, 50% C, 10% D Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 44% (future)

CN(s): 83, 88, 91 (pervious & impervious areas) CN*(s): 80.5, 85.8, 89.0
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2311 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5474 i in./hr. (function of i)

Time of Concentration (T_c): .4174 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 17 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 2.7432 in./hr.

Runoff Supply Rate (q) at T_c: 1.502 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 320 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): .023 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 48% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.7490 i in./hr. (function of i)

Time of Concentration (T_c): .2966 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 8 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 8.28 in./hr.

Runoff Supply Rate (q) at T_c: 6.20 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 1161 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumalative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 48% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6477 i in./hr. (function of i)

Time of Concentration (T_c): .3143 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 10 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 5.10 in./hr.

Runoff Supply Rate (q) at T_c: 3.31 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 619 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 5 yrs.

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 48% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6048 i in./hr. (function of i)

Time of Concentration (T_c): .3231 $i^{-.4}$ hrs./~~minx~~ (function of i)

Iterative Solution of T_c: 11 ~~hrsx~~/mins.

Rainfall Intensity (i) at T_c: 4.25 in./hr.

Runoff Supply Rate (q) at T_c: 2.57 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 482 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Cumulative Drainage Area to C-1

Watershed Area (A): 0.29 ~~acres~~/square miles.

Length of Watercourse (L_c): 6400 ft. Length to Center of Gravity (L_{ca}): 2500 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
3600	120
1800	40
1000	70

Mean Slope (S_c): 0.032 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.023 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 48% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5350 i in./hr. (function of i)

Time of Concentration (T_c): .3393 $i^{-.4}$ hrs./~~mins.~~ (function of i)

Iterative Solution of T_c: 13 ~~hrs./~~mins.

Rainfall Intensity (i) at T_c: 3.10 in./hr.

Runoff Supply Rate (q) at T_c: 1.66 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 310 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): .024 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 46% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.7413 i in./hr. (function of i)

Time of Concentration (T_c): .2189 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 5 ~~hours~~/mins.

Rainfall Intensity (i) at T_c: 9.64 in./hr.

Runoff Supply Rate (q) at T_c: 7.15 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 830 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

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HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-2 and C-1

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: in.

P_6 (6 hour): 2.50 in. Areal Value: in.

P_1 (1 hour): 1.89 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 46% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6361 i in./hr. (function of i)

Time of Concentration (T_c): .2327 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 7 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 5.95 in./hr.

Runoff Supply Rate (q) at T_c: 3.79 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 440 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-1 and C-2

Watershed Area (A): 0.18 ~~acres~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 46% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5915 i in./hr. (function of i)

Time of Concentration (T_c): .2395 $i^{-.4}$ hrs. ~~/mins.~~ (function of i)

Iterative Solution of T_c: 8 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 4.87 in./hr.

Runoff Supply Rate (q) at T_c: 2.88 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 335 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-1 Local runoff between C-1 and C-2

Watershed Area (A): 0.18 x~~xxxxx~~/square miles.

Length of Watercourse (L_c): 4500 ft. Length to Center of Gravity (L_{ca}): 1700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
600	40
2300	80
1100	70

Mean Slope (S_c): 0.0442 ft./ft. Watershed Type(s): Moderate Urbanization (future)

Basin Factor (n_b): 0.024 (future) Flood Frequency: 2 yrs.

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 46% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5190 i in./hr. (function of i)

Time of Concentration (T_c): .2524 $i^{-.4}$ hrs. /~~mins~~ (function of i)

Iterative Solution of T_c: 9 x~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.61 in./hr.

Runoff Supply Rate (q) at T_c: 1.87 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 217 cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

100-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.73 in. Areal Value: in.

P_6 (6 hour): 3.78 in. Areal Value: in.

P_1 (1 hour): 2.77 in. Areal Value: in.

P_2 (2 hour): 3.09 in. Areal Value: in.

P_3 (3 hour): 3.30 in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.28 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .5635 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): 0.7568 i in./hr. (function of i)

Time of Concentration (T_c): 0.1312 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 5 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 9.64 in./hr.

Runoff Supply Rate (q) at T_c: 7.30 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 518 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

10-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 10 yrs.

P_{24} (24 hour): 3.10 in. Areal Value: _____ in.

P_6 (6 hour): 2.50 in. Areal Value: _____ in.

P_1 (1 hour): 1.89 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 84.6 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): .3687 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6594 i in./hr. (function of i)

Time of Concentration (T_c): .1387 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 5 ~~hrs./~~mins.

Rainfall Intensity (i) at T_c: 6.58 in./hr.

Runoff Supply Rate (q) at T_c: 4.34 in./hr.

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 308 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

5-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~acres~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 5 yrs

P_{24} (24 hour): 2.67 in. Areal Value: in.

P_6 (6 hour): 2.18 in. Areal Value: in.

P_1 (1 hour): 1.63 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN^*(s): 83.2 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .2861 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .6180 i in./hr. (function of i)

Time of Concentration (T_c): .1423 $i^{-.4}$ hrs./~~mins~~ (function of i)

Iterative Solution of T_c: 5 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 5.67 in./hr.

Runoff Supply Rate (q) at T_c: 3.51 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

645.33qA (square miles): 249 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, $CN^* = 99$ (constant).

HYDROLOGIC DATA SHEET

2-YEAR
FUTURE CONDITION

Project Name and Location: HIGHLANDS WASH BASIN MANAGEMENT PLAN, North Tucson, Arizona

Drainage Concentration Point: C-2 Local runoff

Watershed Area (A): 0.11 ~~xxxxx~~/square miles.

Length of Watercourse (L_c): 2000 ft. Length to Center of Gravity (L_{ca}): 700 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
2000	70

Mean Slope (S_c): 0.035 ft./ft. Watershed Type(s): Light to Moderate Urbanization (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 2 yrs

P_{24} (24 hour): 2.00 in. Areal Value: in.

P_6 (6 hour): 1.65 in. Areal Value: in.

P_1 (1 hour): 1.27 in. Areal Value: in.

P_2 (2 hour): in. Areal Value: in.

P_3 (3 hour): in. Areal Value: in.

Soil Group(s): B Cover Type(s): Desert Brush

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 80.5 (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): .1519 (pervious areas) .95 (impervious areas)

Runoff Supply Rate (q): .5510 i in./hr. (function of i)

Time of Concentration (T_c): .1490 $i^{-.4}$ hrs./~~xxxxx~~ (function of i)

Iterative Solution of T_c: 5 ~~xxxx~~/mins.

Rainfall Intensity (i) at T_c: 4.42 in./hr.

Runoff Supply Rate (q) at T_c: 2.43 in./hr.

Peak Discharge:

1.008 qA (acres): cfs.

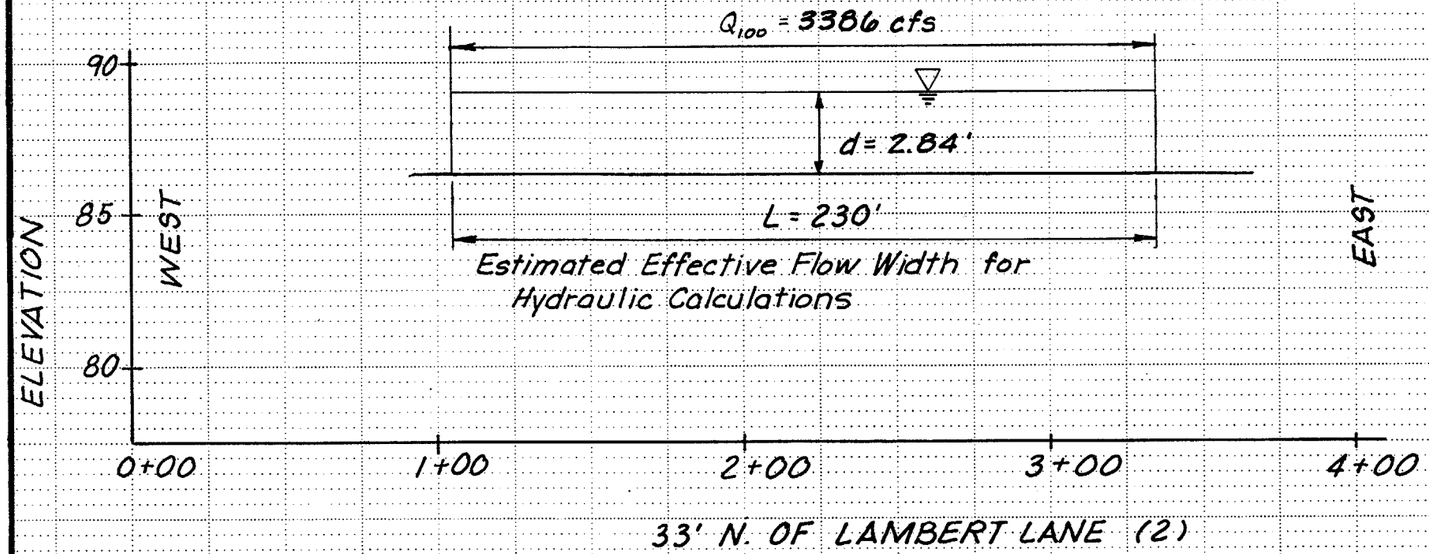
645.33qA (square miles): 173 cfs.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

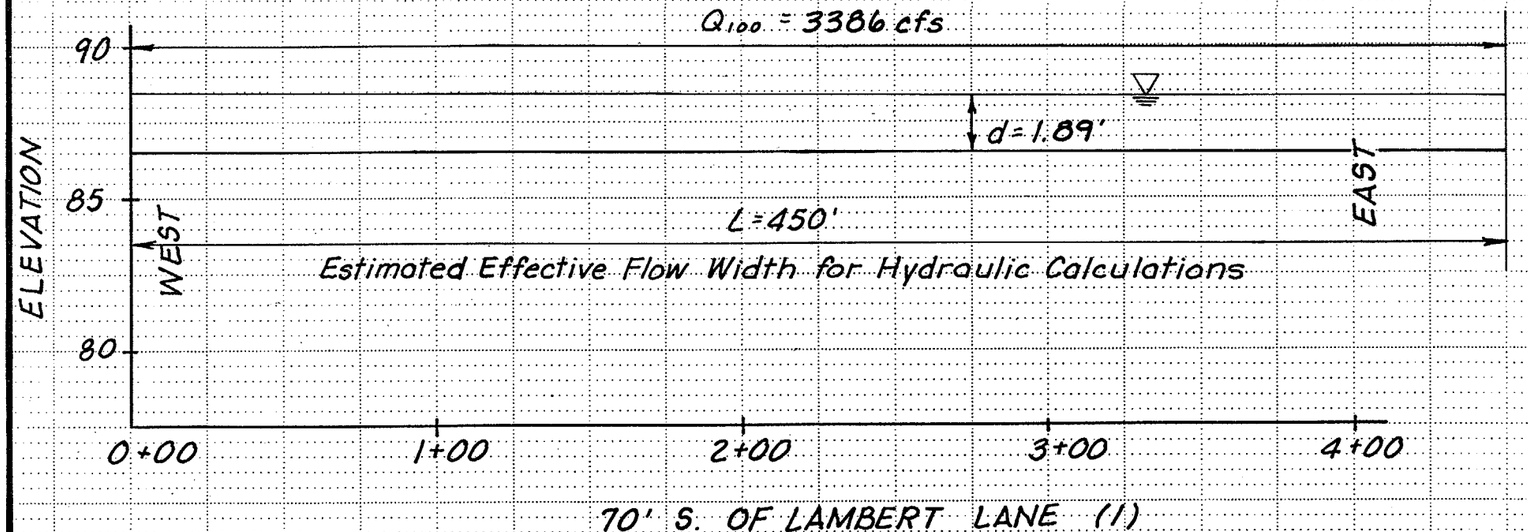
Note: For impervious areas, CN* = 99 (constant).

Appendix B



Q_{100} (cfs)	3386	600
b (ft.)	230	230
S (ft./ft.)	0.005	0.005
SS (ft./ft.)	0.001	0.001
n	0.04	0.04
WP (ft.)	235.7	232
Area (SQ. ft.)	653.2	230
d (ft.)	2.84	1.0*
V (ft./S.)	5.18	2.61
Fr.	0.54	0.45

*Capacity of Lambert Lane Dip Section at 1.0 Foot of Flow Path



Q_{100} (cfs)	3386
b (ft.)	450
S (ft./ft.)	0.005
SS (ft./ft.)	0.001
n	0.04
WP (ft.)	453.8
Area (SQ. ft.)	850.5
d (ft.)	1.89
V (ft./S.)	3.99
Fr	0.51

NOTE: Cross Sections Are Plotted Looking Upstream

CROSS-SECTIONS 1&2

DESIGN L.S.M.	SCALE	JOB NO.	DATE	APP. B
DRAWN R.D.G.	HORZ. AS NOTED	4583-01	3-6-86	
CHECK L.J.C	VERT. ———			

Anderson-Nichols & Co., Inc.
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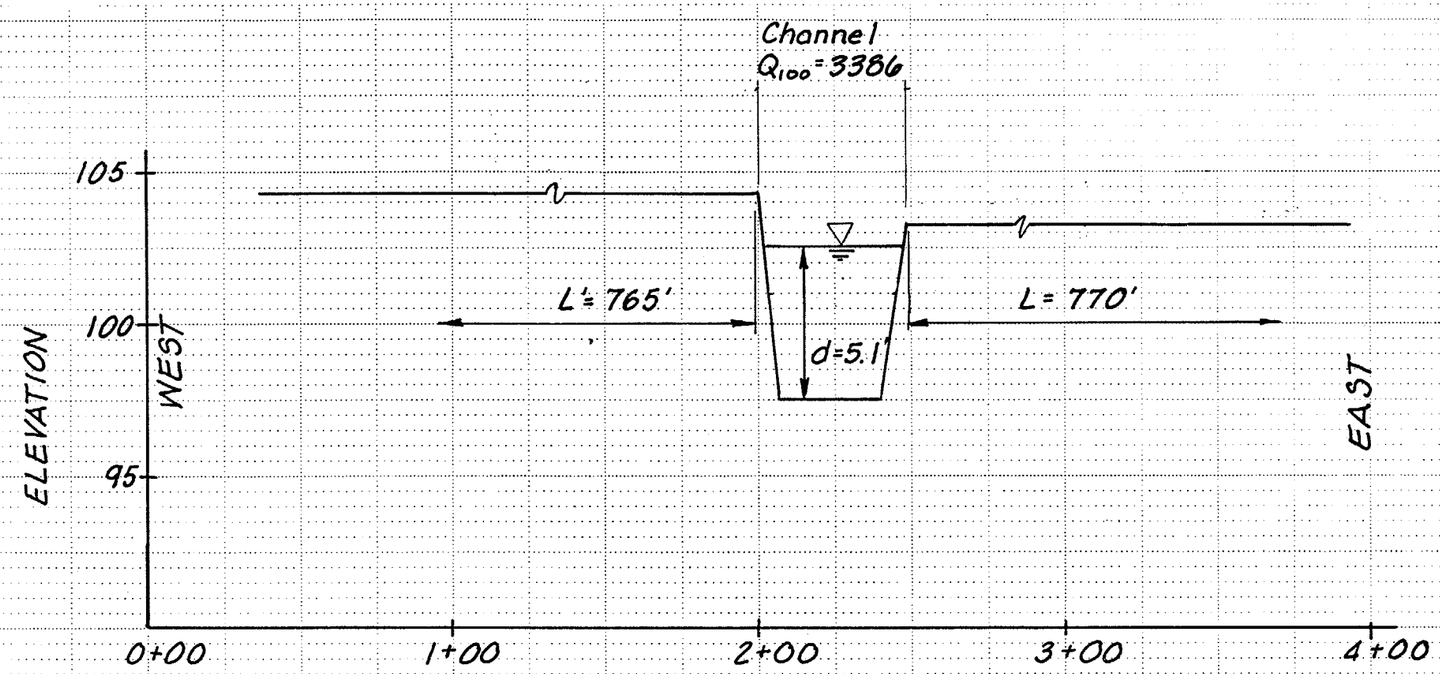
PHOENIX, ARIZONA

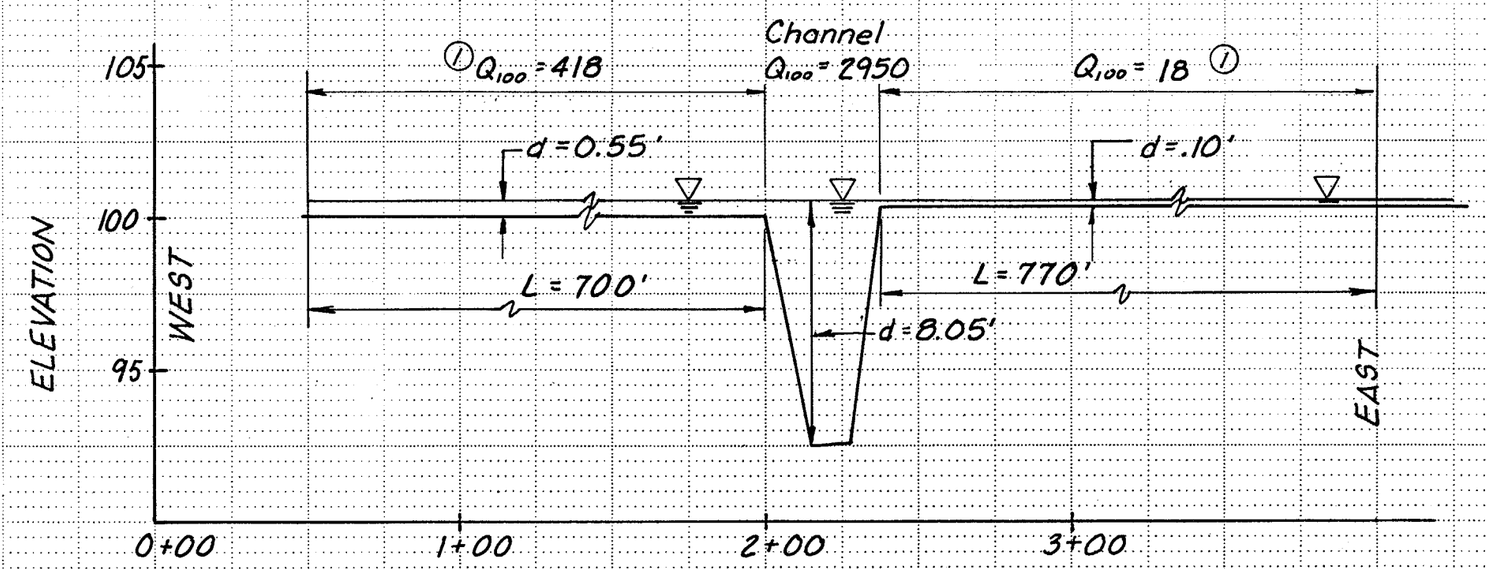
B-1



82' N. OF MATTERHORN St. (4)

		West Overbank ①	Channel	East Overbank ①
	Q_{100} (cfs)		3386	
	S (ft/ft)		0.030	
②	SS (ft/ft)		1.500	
	n		0.04	
	b (ft)		33	
	WP (ft)		51.4	
	Area (SQ. ft)		207.3	
	d (ft)		5.1*	
	V (ft/S)		16.36	
	Fr		1.28	

* Backwater Over Matterhorn St. Controls (See Weir Flow Calculations and Drainage Easement Profile, Appendix B)



65' S. OF MATTERHORN St. (3)

		West Overbank ①	Channel	East Overbank ①
	Q_{100} (cfs)	418	2950	18
	S (ft/ft)	0.01	0.019	0.01
②	SS (ft/ft)	0.001	1.60	0.001
	n	0.09	0.04	0.09
	b (ft)	700	12.5	770
	WP (ft)	701	42.9	700
	Area (SQ. ft)	385	204.3	70
	d (ft)	0.55	8.05	0.10
	V (ft/S)	1.11	14.5	0.36
	Fr	0.26	0.90	0.20

① Flow Through The Highlands Subdivision

② Sideslope (S.S.)-Horz. (ft.) to Vert (ft.)

NOTE: Cross Sections Are Plotted Looking Upstream

CROSS-SECTIONS 3&4

DESIGN L.S.M.	SCALE	JOB NO.	DATE	APP. B
DRAWN R.D.G.	HORZ. AS NOTED	4583-01	3-6-86	
CHECK L.J.C.	VERT.			

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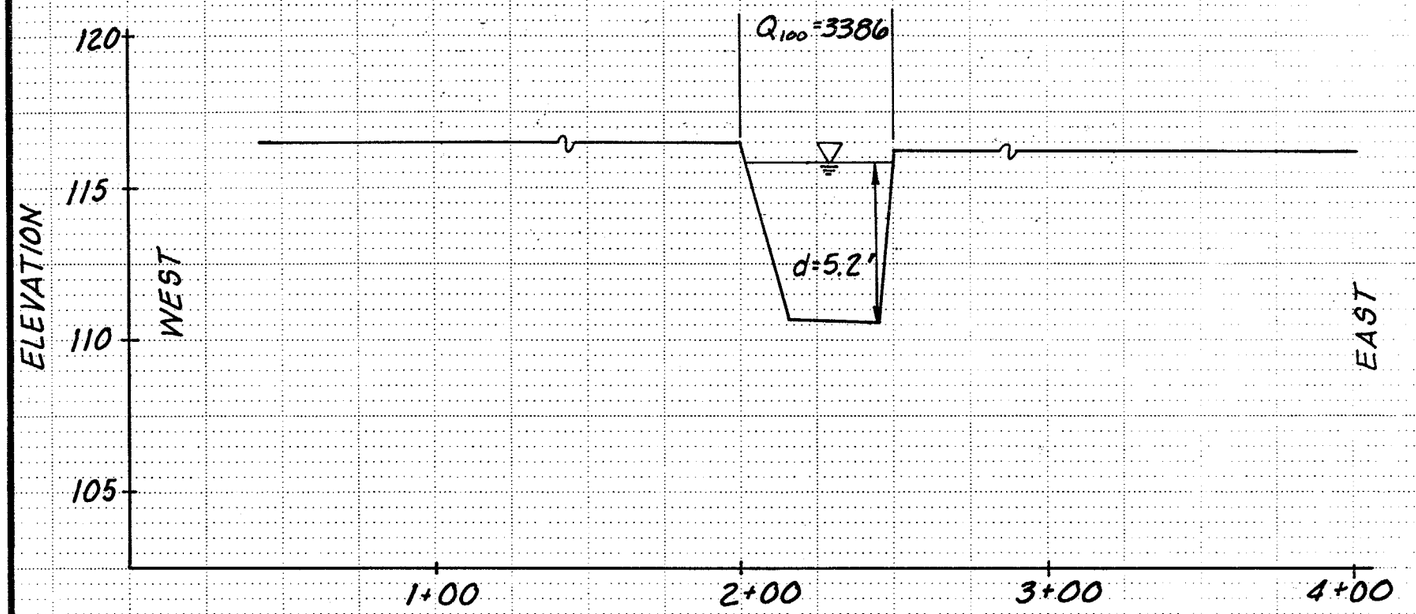
PHOENIX, ARIZONA

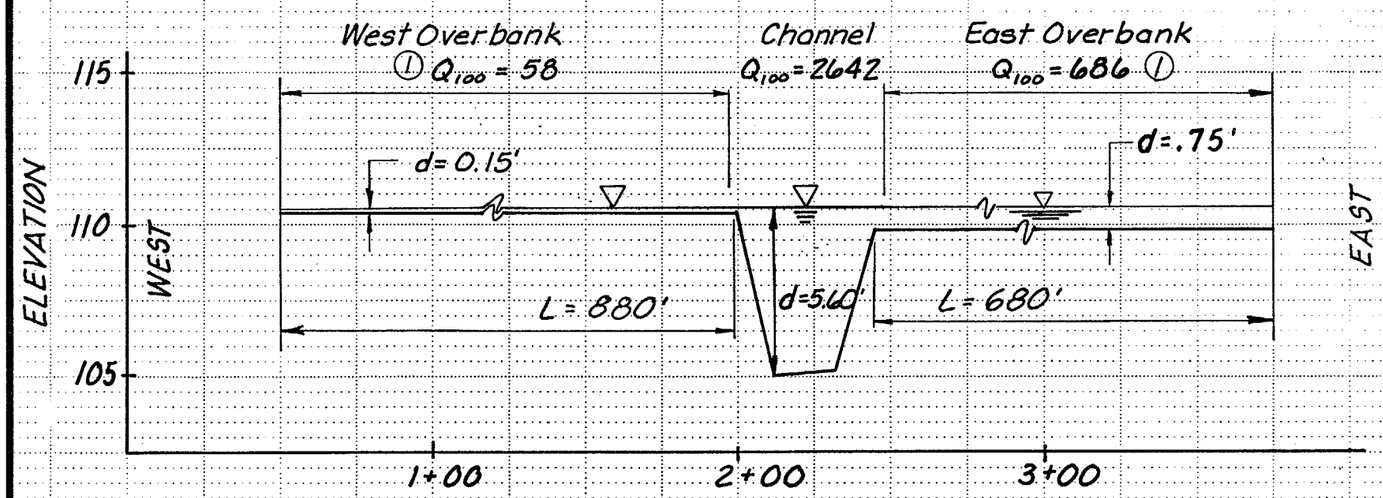
B-2



130' S. OF APPALACHIAN St (6)

		①	①
	Q_{100} (cfs)	3386*	
	S (ft./ft.)	0.0241	
②	SS (ft./ft.)	1.75	
	n	0.04	
	b (ft.)	35	
	WP (ft.)	56.0	
	Area (SQ.ft.)	229	
	d (ft.)	5.2	
	V (ft./S.)	14.8	
	Fr	1.14	

*Overbank Flow from Section 7 May Not be Able to Get Back Into Channel Section



348' N. OF MATTERHORN St. (5)

Channel To Top Low Bank		West Overbank ①	Channel	East Overbank ①
1990	Q_{100} (cfs)	58	2642	686
0.0241	S (ft./ft.)	0.01	0.0241	0.01
2.5	② SS (ft./ft.)	0.001	2.5	0.001
0.04	n	0.09	0.04	0.09
20	b (ft.)	880	20	680
45.8	WP (ft.)	880	50.2	681.5
153.6	Area (SQ. ft.)	132	190.4	510.0
4.8	d (ft.)	0.15	5.6	0.75
13.0	V (ft./S)	0.47	14.03	1.36
1.05	Fr	0.20	1.04	0.27

① Flow Through The Highlands Subdivision

② Sideslope (SS)-Horz. (ft.) to Vert. (ft.)

NOTE: Cross Sections Are Plotted Looking Upstream

CROSS-SECTIONS 5&6

DESIGN L.S.M	SCALE	JOB NO.	DATE	
DRAWN R.D.G.	HORZ. AS NOTED	4583-01	3-6-86	APP. B
CHECK L.J.C	VERT. ———			

Anderson-Nichols & Co., Inc.
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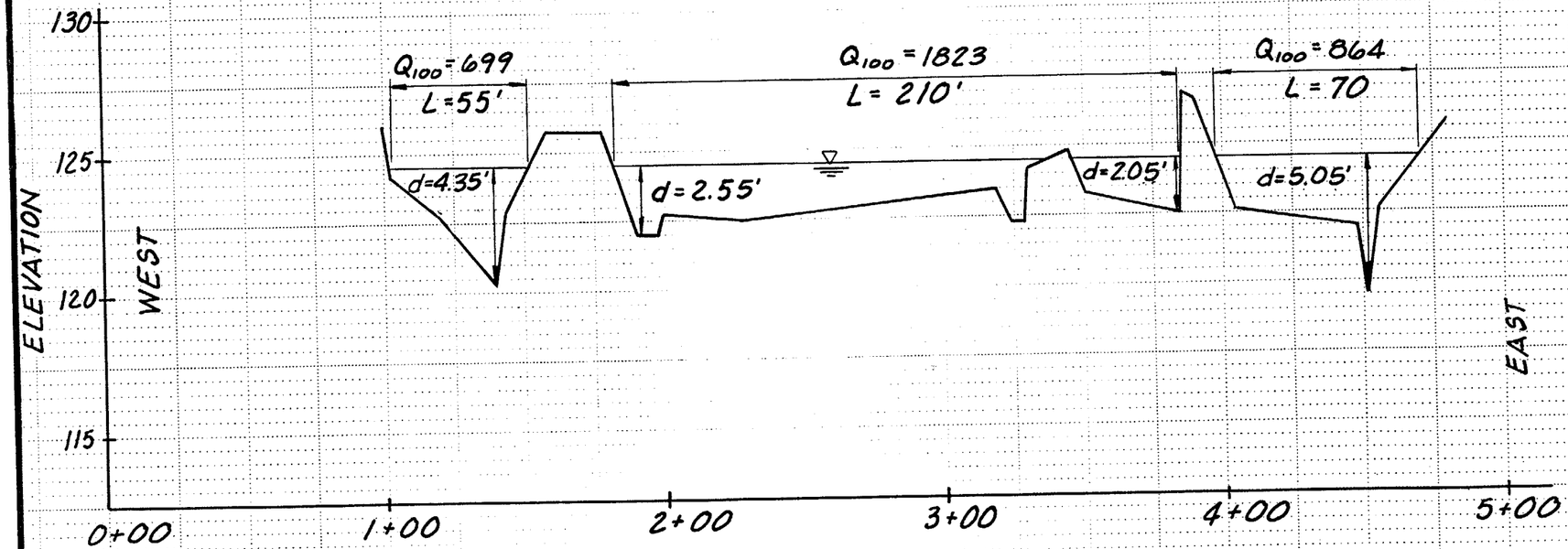
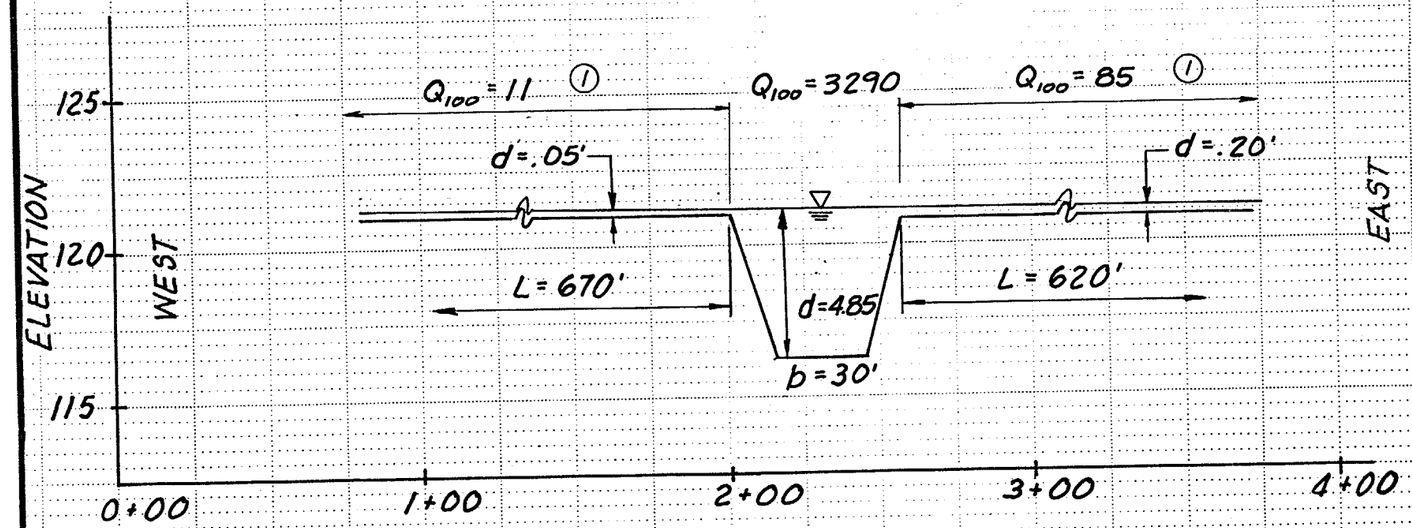
PHOENIX, ARIZONA

B-3



Q_{100} (cfs)	699	1823	864
S (ft./ft.)	0.0144	0.0144	0.0144
n	0.035	0.035	0.035
Area (SQ. ft.)	90	279	118
WP (ft.)	49	196	70
d_{max} (ft.)	4.35	2.55	5.05
V (ft./s.)	7.77	6.53	7.32
Fr	0.66	0.72	0.57

275' N. OF APPALACHIAN St. (8)



	①		①
Q_{100} (cfs)	11	3290	85
S (ft./ft.)	0.01	0.0303	0.010
② SS (ft./ft.)	0.001	3	0.001
n	0.09	0.04	0.09
b (ft.)	670'	30'	620'
d (ft.)	0.05	4.85	0.20
V (ft/S)	0.22	15.09	0.56
Area (SQ/ft)	33.0	216.1	124
WP (ft.)	660.1	60.7	620.4
Fr	0.17	1.21	0.22

55' N. OF APPALACHIAN St. (7)

NOTE: Cross Sections Are Plotted Looking Upstream

① Flow Through The Highlands Subdivision

② Sideslope (SS) - Horz. (ft.) to Vert. (ft.)

CROSS-SECTIONS 7&8

DESIGN L.S.M.	SCALE	JOB NO.	DATE	APP. B
DRAWN R.D.G.	HORZ. AS NOTED	4583-01	3-6-86	
CHECK L.J.S.	VERT. —			

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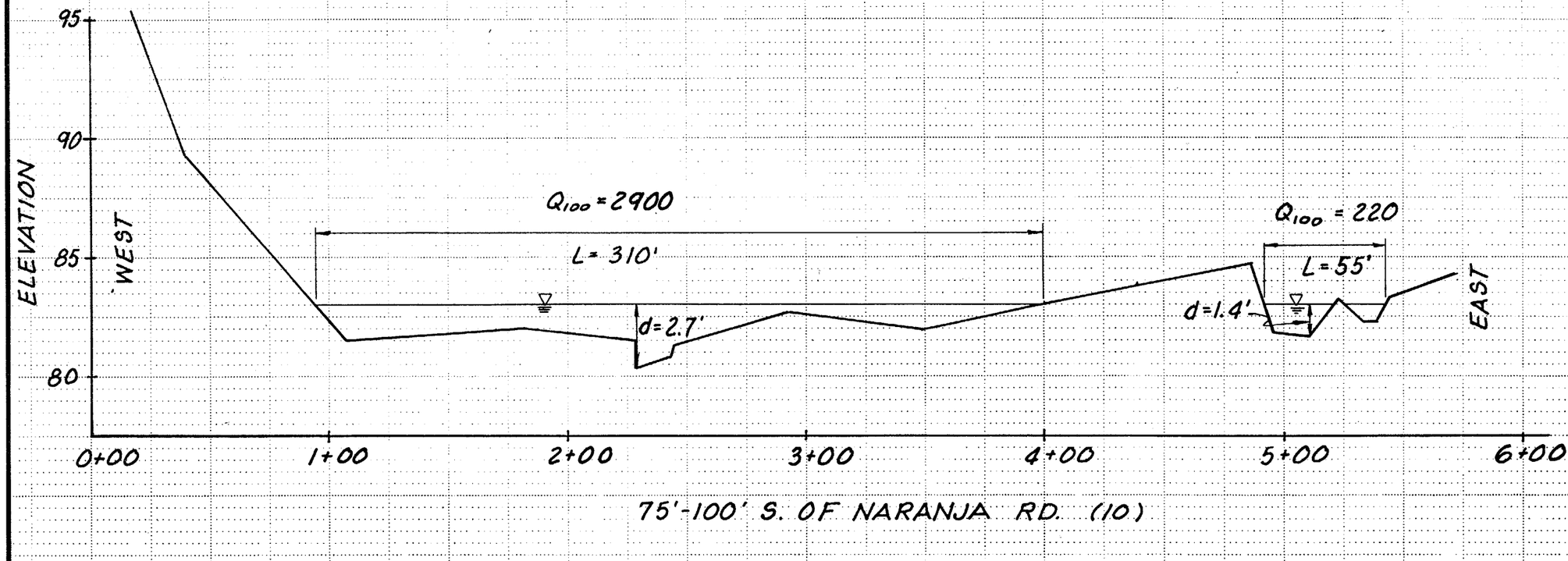
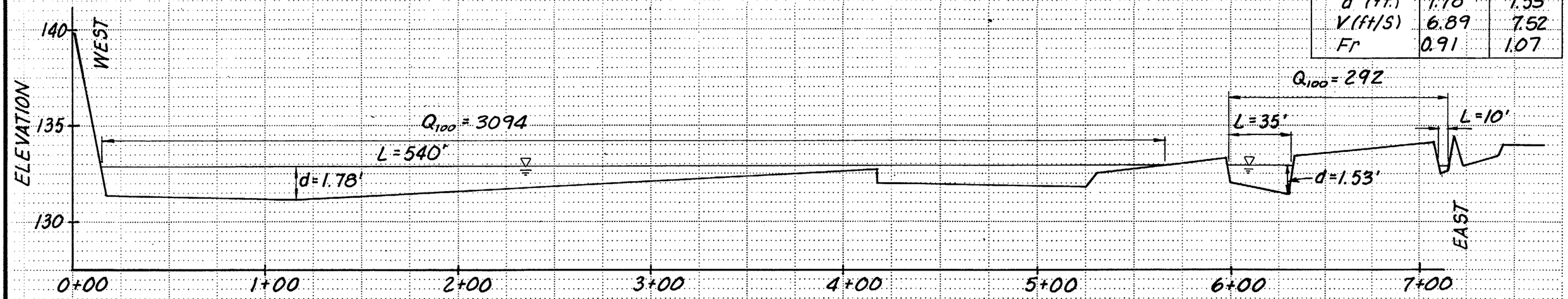
PHOENIX, ARIZONA

B-4



75'-100' S. OF NARANJA RD. (10)

Q_{100} (cfs)	2900	220
S (ft/ft.)	0.0354	0.0354
n	0.035	0.035
Area (SQ.ft.)	341.8	36.6
WP (ft.)	310	50
d (ft.)	2.7	1.4
V (ft./S)	8.55	6.50
Fr	0.92	0.97



2400' S. OF NARANJA RD. (9)

Q_{100} (cfs)	3094	292
S (ft/ft.)	0.0333	0.0333
n	0.035	0.035
Area (SQ.ft.)	449	39
WP (ft.)	544	41.1
d (ft.)	1.78	1.53
V (ft/S)	6.89	7.52
Fr	0.91	1.07

NOTE: Cross Sections Are Plotted Looking Upstream

CROSS-SECTIONS 9&10

DESIGN L.S.M.	SCALE	JOB NO.	DATE	APP. B
DRAWN R.D.G.	HORZ AS NOTED	4583-01	3-6-86	
CHECK L.J.C.	VERT			

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B-5

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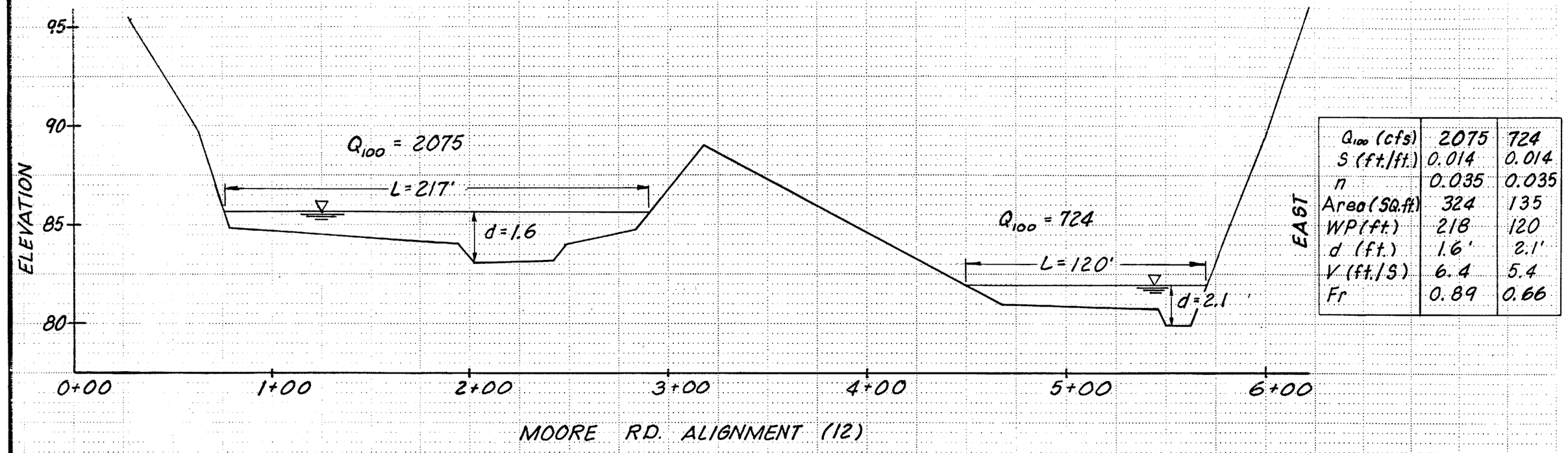
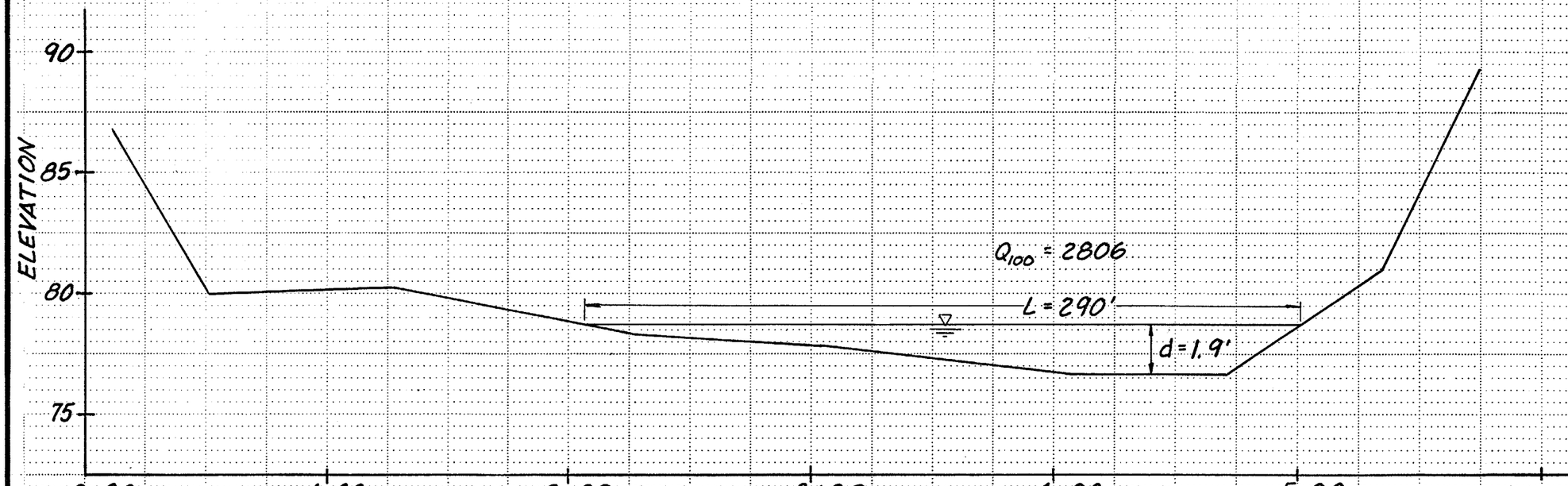


MOORE RD. ALIGNMENT (12)

Q_{100} (cfs)	2075	724
S (ft./ft.)	0.014	0.014
n	0.035	0.035
Area (SQ.ft.)	324	135
WP (ft.)	218	120
d (ft.)	1.6'	2.1'
V (ft./S)	6.4	5.4
Fr	0.89	0.66



50'-75' N. OF TANGERINE RD. (11)

Q_{100} (cfs)	2806
S (ft./ft.)	.0444
n	.035
Area (SQ.ft.)	313
WP (ft.)	312
d (ft.)	1.9'
V (ft./S)	8.99
Fr.	1.15

NOTE: Cross Sections Are Plotted Looking Upstream

CROSS-SECTIONS 11&12

DESIGN L.S.M.	SCALE	JOB NO.	DATE	APP. B
DRAWN R.D.G.	HORZ. AS NOTED	4538-01	3-6-86	
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B-6

WEIR FLOW CALCULATIONS OVER SPILLWAY AND EMBANKMENT

Sand and Gravel Pit Sedimentation Basin

Assume Q_{100} = 1,681 cfs (Drainage Area I.D. W-2, near Naranja Road)

Assume spillway acts as broadcrested weir with C = 2.63

Q = CL(H) 3/2

See Figure 6 for spillway and embankment dimensions.

Estimate equivalent rectagular width for trapezoidal weir opening for depth of 4 feet for use in weir equation.

Area at 4-foot depth = ([(4x2) + (4x3) + 40]/2) x 4 = 120 sq. ft.

Equivalent rectangular width for use in weir equation is ^{area}/depth = 120 sq. ft./4 feet = 30.0 feet

Spillway capacity at 4 foot depth to top of embankment is:

Q = CL(H) 3/2
= 2.63 (30)(4)3/2
= 631 cfs.

By trial and error;
at 4.95 feet depth above spillway invert and 0.95 foot depth above top of embankment, the weir flow capacity for the spillway is;

Area at 4.95 foot depth ([(4.95 x 2) + (4.95 x 3) + 40] /2) x 4.95 = 160.2 square feet.

Equivalent rectangular width for use in weir equation is area/depth = 160 square feet/4.95 square feet = 32.4 feet.

spillway: Q = CL(H) 3/2
= 2.63 (32.4)(4.95) $^{3/2}$
= 938 cfs

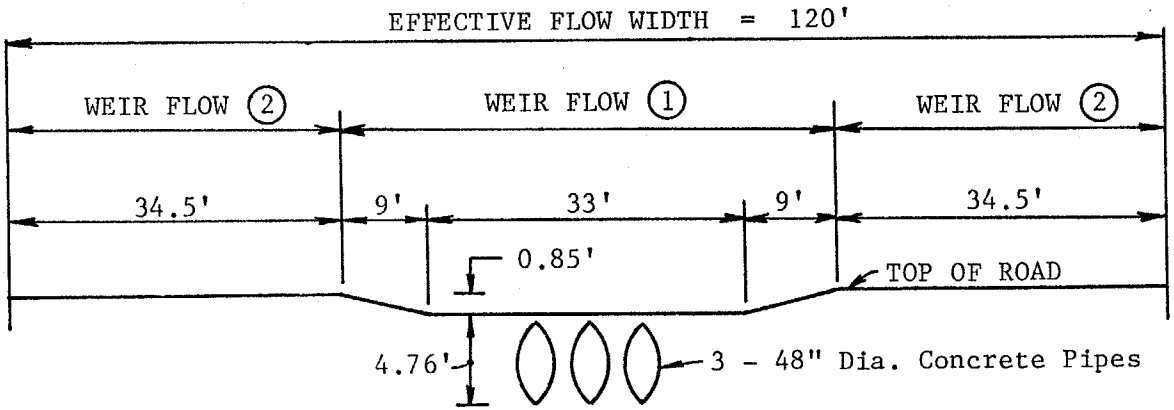
plus embankment: Q = CL(H) 3/2
= 2.63 (300) (0.95)3/2
= 730 cfs

TOTAL DISCHARGE = 938 cfs + 730 cfs =
1,658 cfs $\approx$ Q_{100} = 1,681 cfs (∴ OK)

WEIR FLOW CALCULATIONS OVER ROADWAY

Matterhorn Street at Highlands Wash

Adjacent residential buildings and block walls restrict the width to which weir flow over Matterhorn Street can spread out to approximately 120 feet. Assume Q_{100} = 3,386 cfs is conveyed within the channel to the Matterhorn Road Crossing.



DEPTH OF FLOW ABOVE TOP OF ROAD (feet)	EFFECTIVE WEIR WIDTH AREA 1 (feet)	EFFECTIVE WEIR WIDTH AREA 2 (feet)	TOTAL WEIR DISCHARGE OVER ROAD 1 + 2 Q = CLH 3/2 C = 2.63 (cfs)	DEPTH OF FLOW ABOVE PIPE INVERT (feet)	DISCHARGE IN PIPE (see attached calculations) (cfs)	TOTAL DISCHARGE (cfs)
0.0	0.0	0.0	0.0	4.76	290	290
1.0	43.4	69	125	5.76	360	485
2.0	47.2	69	575	6.76	420	995
3.0	48.5	69	1,234	7.76	480	1,714
4.0	49.1	69	2,048	8.76	510	2,550
4.75	49.4	69	2,743	9.41	530	3;273
4.85	49.4	69	2,839	9.61	545	3,384

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PROJECT: Highlands Wash Basin Management Plan
Matterhorn Street at Highlands Wash

DESIGNER: GAS

DATE: May 2, 1986

HYDROLOGIC AND CHANNEL INFORMATION

Q_1 = _____ TW_1 = _____

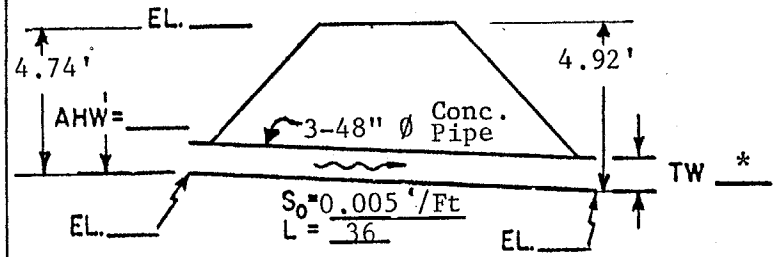
Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

Ref. 8: HEC-5
Circular

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	TOTAL Q - (cfs)	SIZE	HEADWATER COMPUTATION										CONTROLLING H.W.	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW=H + h_o - LS_o											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW *	h_o	LS_o	HW				
Groove-end Projecting	200	48"	0.91	3.64	0.2	0.6	2.5	3.25	N/A	3.25	0.18	3.67	3.67			Outlet Control
Groove-end Projecting	290	48"	1.19	4.76	0.2	1.35	3.0	3.50	N/A	3.5	0.18	4.67	4.76			Inlet Control
Groove-end Projecting	360	48"	1.44	5.76	0.2	2.05	3.3	3.65	N/A	3.65	0.18	5.52	5.76			Inlet Control
Groove-end Projecting	420	48"	1.69	6.76												Assume Inlet Cont.
Groove-end Projecting	480	48"	1.94	7.76												Assume Inlet Cont.
Groove-end Projecting	510	48"	2.19	8.76												Assume Inlet Cont.
Groove-end Projecting	545	48"	2.4	9.61	0.2	4.4	4.0	4.0	5.4	5.4	0.18	9.62	9.62			

SUMMARY & RECOMMENDATIONS: Capacity of 3 - 48" Dia. Conc. Pipes at Matterhorn Street over Highlands Wash is 290 cfs to top of road.

* See Drainage Easement Profile, Figure 8 and Section 3, Hydraulic Calculations, Appendix B.

HYDRAULIC CALCULATIONS

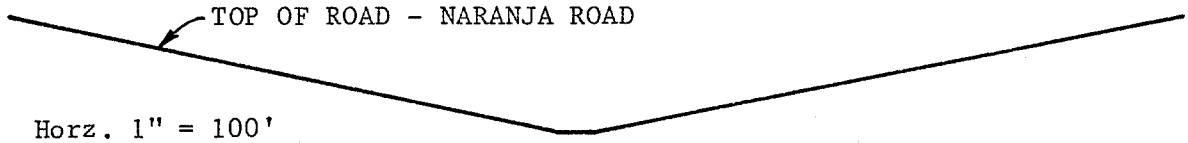
Naranja Road at Highlands Wash

Q_{100} = 3,120 (Drainage I.D. H-2)

Longitudinal Slope = 0.0345 1/ft.

Manning's 'n' = 0.025 (gravel roadway dip section)

Since Naranja Road is a dip section crossing conforming to the general cross-section of the Highlands Wash, assume normal depth flow computed by Manning's equation, $Q = \frac{1.486}{n} A (R)2/3 (S)1/2$



SCALE: Horz. 1" = 100'
Vert. 1" = 10'

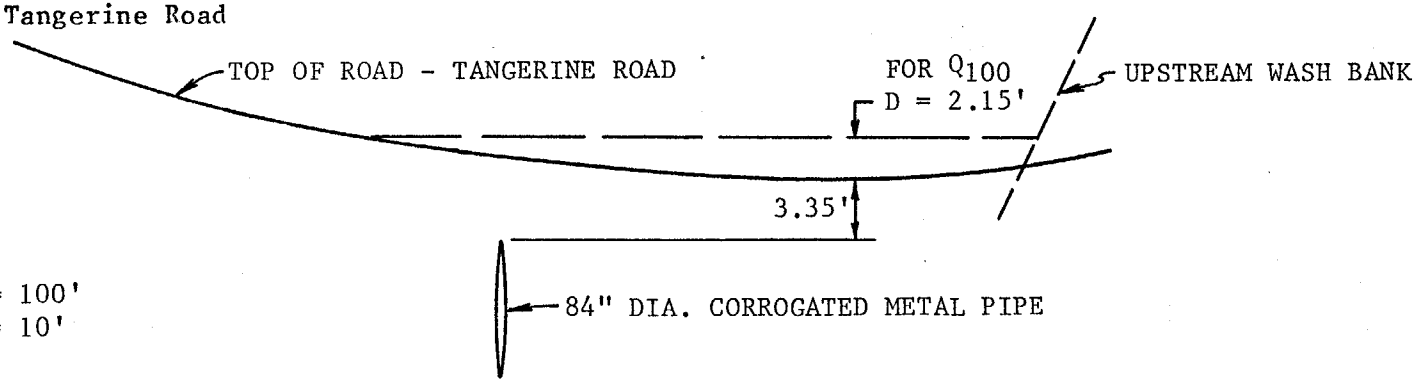
DEPTH OF FLOW ABOVE TOP OF ROAD (feet)	AREA OF FLOW ABOVE TOP OF ROAD (sq. ft.)	TOP WIDTH (feet)	HYDRAULIC RADIUS R = AREA/ TOP WIDTH (feet)	NORMAL DEPTH DISCHARGE OVER ROADWAY (cfs)
0.0	0.0	0.0	0.0	0.0
1.0	70	120	0.58	545
2.0	240	220	1.09	2,845
2.1	252	220	1.15	3,087*
2.15	263	225	1.17	3,268

* Q_{100} = 3,121 cfs (∴ OK)

WEIR FLOW CALCULATIONS OVER ROADWAY

Tangerine Road at Highlands Wash

Q_{100} = 2,806 cfs at Tangerine Road



SCALE: Horz. 1" = 100'
Vert. 1" = 10'

DEPTH OF FLOW ABOVE TOP OF ROAD (feet)	AREA OF FLOW ABOVE TOP OF ROAD (feet)	EFFECTIVE WEIR WIDTH L = AREA/DEPTH (feet)	WEIR DISCHARGE OVER ROAD $Q = CLH^{3/2}$ C = 2.63 (cfs)	DEPTH OF FLOW ABOVE PIPE INVERT (feet)	DISCHARGE IN PIPE (see attached calculations) (cfs)	TOTAL DISCHARGE (cfs)
0.0	0.0	0.0	0.0	10.35	410	410
1.0	188	188	494	11.35	435	929
1.5	357	238	1,150	11.85	460	1,610
2.0	563	282	2,098	12.35	470	2,568
2.1	598	285	2,281	12.45	475	2,756
2.2	638	288	2,472	12.55	480	2,952

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PROJECT: Highlands Wash Basin Management Plan
Tangerine Road at Highlands Wash

DESIGNER: GAS

DATE: May 2, 1986

HYDROLOGIC AND CHANNEL INFORMATION

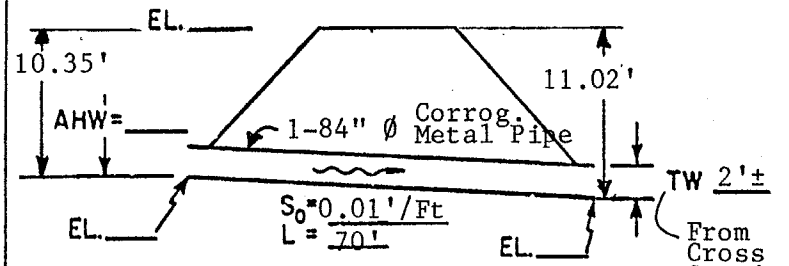
Ref. 8: HEC-5
Circular

Q_1 = _____ TW_1 = _____
Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q (cfs)	SIZE	HEADWATER COMPUTATION										CONTROLLING H.W.	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW=H+h_o-LS_o											
			HW/D	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
Corrog. Metal Pipe Project.	410	84"	1.48	10.35	0.9	4.4	5.35	6.18	2'±	6.18	0.67	9.91	10.35			Inlet Control
Corrog. Metal Pipe Project.	435	84"	1.62	11.35	0.9	5.0	5.5	6.25	2'±	6.25	0.67	10.58	11.35			Inlet Control 1.0' Above Top
Corrog. Metal Pipe Project.	460	84"	1.69	11.85												Assume Inlet Control
Corrog. Metal Pipe Project.	470	84"	1.76	12.35												Assume Inlet Control
Corrog. Metal Pipe Project.	475	84"	1.78	12.45												Assume Inlet Control
Corrog. Metal Pipe Project.	480	84"	1.79	12.55												Assume Inlet Control

SUMMARY & RECOMMENDATIONS: Capacity of 1 - 84" Dia. Corragated Metal Pipe (CMP) at Tangerine Road over Highlands Wash is 410 cfs to top of Road.

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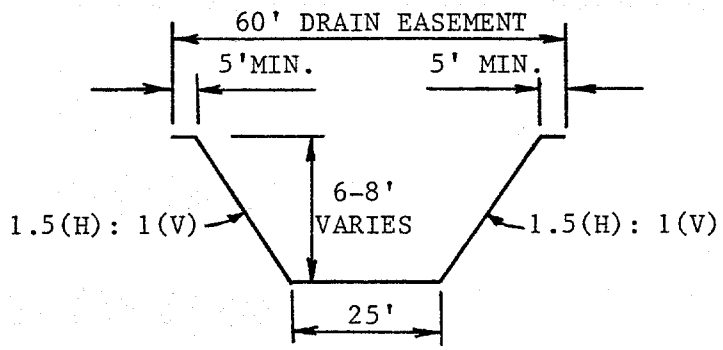
HYDRAULIC CALCULATIONS

Possible Channel Improvement Within 60-Foot Drainage Easement Through The Highlands Subdivision

See Figure 4 Drainage Easement Profile.

Assume concrete lined channel within 60-foot easement;



Allow freeboard of approximately 3 feet above normal depth to top of lining and soffit of culvert.

Average improved channel slope is 0.023 ^{1}/ft.

Try normal depth of 3.3 feet

A = 98.8 sq. ft.
Pw = 36.9 feet
n = 0.016
V = 27.3 feet/sec.
Q = 2,694 cfs
Fr = 2.6 ($\therefore$ Supercitical)

At this velocity, would recommend minimum of three, 10' (span) x 6' (rise) box culverts at Matterhorn to allow adequate freeboard for waves, etc.

Appendix C

Anderson-Nichols
4120 North 20th Street
Phoenix, Arizona 85016
(602) 957-3681

Woodrow C. Scoutten, P.E.
Vice President

October 14, 1985

Mr. C.H. Huckleberry, Director
Pima County Transportation and
Flood Control District
1313 South Mission Road
Tucson, AZ 85713-1398

Attn: Ms. Marie Pearthree,
Flood Control Planning

Re: Highlands Basin Management Study

Dear Mr. Huckleberry:

This letter report is in response to a request by Pima County Flood Control District officials on August 26, 1985. Anderson-Nichols was asked to conduct a field visit and brief evaluation and assessment of flooding at the Highlands Trailer Park in Highlands Wash. The field visit was conducted on August 28, 1985 to assess reports of flooding in the trailer park area on the weekend of August 24-25, 1985.

The two areas of concern that Anderson-Nichols observed were the inundation of Matterhorn Street at the Highlands Wash crossing and flooding of one lot adjacent to the levee protecting the Highlands trailer park on the north (see attached Vicinity Map).

Apparently, flood waters dislodged a Palo Verde tree, carried it to the Matterhorn Street crossing, and lodged it in one or more of the three, 48-inch diameter RCP culverts. This restriction in the flow capacity of the culverts caused a backwater which eventually overtopped the street, flowed in the overflow dip section across the street, and re-entered the channel downstream of Matterhorn Street.

Photographs from previous field investigations taken in mid-1981 showed about one foot of sedimentation in the channel upstream of, and including, these culverts. On August 28, 1985, the culvert entrances were one-half full of sediment. However, the sedimentation and backwater of the culverts and the upstream channel is not solely a product of the tree blocking the culverts during this storm.

It appears that the culverts under Matterhorn Street need to be either supplemented with additional culverts or replaced with box culverts of greater flow capacity. This improvement would eliminate the reduction in the channel capacity at the road crossing which has caused floodwaters to backwater and flow over the roadway and deposit sediment in the channel upstream.

The flooding of Lot 40 of The Highlands development was caused by a breach in the protection levee along the north side of the development. The top of this levee is nearly level from its intersection with the channel to the ridge on the east. It appears that the upstream (eastern) end failed during the storm due to sedimentation at the levee toe which allowed the water elevation to rise and overtop the levee, thus causing the levee to breach.

As a solution to this problem, we recommend that the top of the levee be raised at the eastern end near the breach location and sloped back to its present elevation near the channel at Appalachian Street (see Vicinity Map). Raising the levee would allow the flow intersecting the levee near the breach location to develop enough hydraulic gradient to flow along the levee to the channel. The northern slope of the entire levee should be armored to prevent erosion. The existing levee as it transitions into the channel near Appalachian Street and Kilimanjaro Avenue is particularly in need of bank protection as erosion has already occurred as a result of the August flooding.

If there are any questions, please do not hesitate to call.

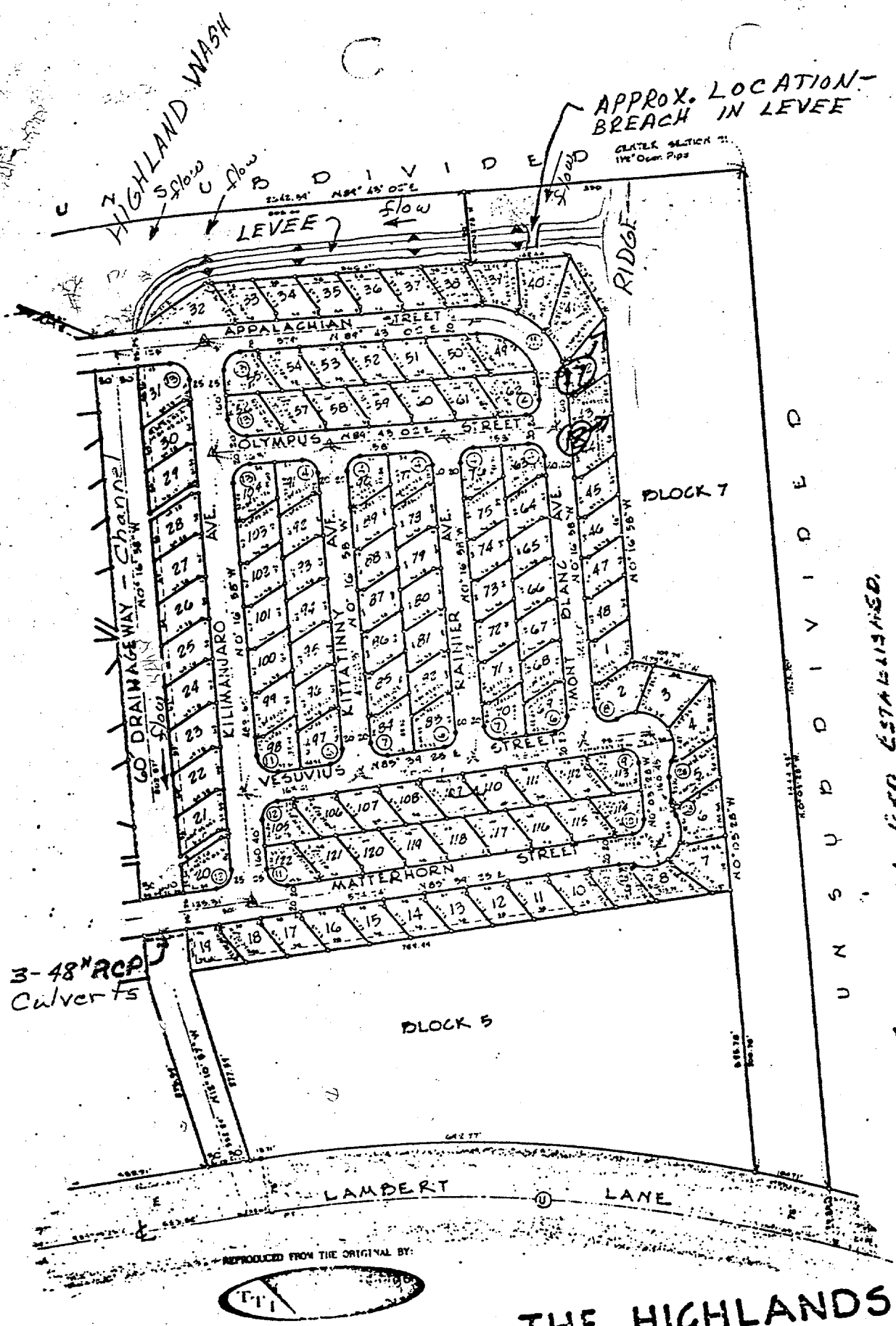
Sincerely,

ANDERSON-NICHOLS & COMPANY, INC.

Greg A. Schuelke, P.E.
Project Manager

GAS/sld

enclosure



THE HIGHLANDS

REC. 9-20-60
B 15 P21
SHEET 1 OF 2

VICINITY MAP

ARIZONA STATE MUSEUM

THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

January 3, 1986

Mr. Gregory A. Schuelke
Anderson-Nichols & Company, Inc.
4120 North 20th Street
Phoenix, Arizona 85016

According to my land status maps there are state and private lands in your planning unit. I have attached Pima County Resolution No. 1983-104 and a copy of the antiquities act enforcement guidelines that apply to Arizona State Trust Lands.

The Arizona State Museum, University of Arizona recommends that all unsurveyed parcels be field checked prior to any land or drainage modification activities. All sites should be avoided however, if this is not possible, then a site mitigation plan may have to be considered, particularly on State Trust Lands and on parcels where federal funding is used.

Attached is your drainage map of the Highlands Wash Basin Project. Known archaeological remains are indicated in orange (I have attached a discription of each) and full coverage survey areas are blocked out in yellow. Seven prehistoric sites were found during full coverage survey inside your project area. There is a high probablity that many more sites lie within unsurveyed parcels. Mr. William H. Doelle (Institute for American Research, Tucson -602-622-6663) will be conducting a large scale archaeological survey in the immediate area of your drainage basin study.

Please do not circulate the site location map. Such information should only be given to individuals who are directly related to the project and have a need to know. If I can help you in any other way please give me a call at 621-4011.

Sincerely,

John H Madsen

John H. Madsen
Assistant Archaeologist

JHM:ajc

Encl. (1)

Site Discriptions

9-00 Village: Max. Diam. 80 Acres.
An extensive light to moderate density artifact scatter with surface and subsurface features.

9-87 Village: Max Diam (M) 400 meters.
An extensive moderate to low density sherd and lithic scatter. There is one feature (fire hearth) eroding out of a drainage cut.

9-102 Artifact Scatter: Max. Diam 50 meters
A low density sherd and lithic scatter.

9-103 Artifact Scatter: Max Diam. 80 meters
A low density sherd and lithic scatter.

9-104 Village: Max. Diam. 800 meters
An extensive artifact scatter in association with 24 trash mounds and other surface features. Subsurface features are likely.

9-105 Camp: Max. Diam. 100 meters
A light density sherd and lithic scatter associated with one roasting pit.

9-109 Village: Max Diam. 150 meters.
A thin scatter of sherds and lithics associated with ashy deposites and firecracked rocks.

9-110 Artifact Scatter: Max Diam 30 meters.
Approximately 40 sherds and two hammerstones scattered over a flat ridge top.

RESOLUTION NO. 1983- 104

WHEREAS, the Pima County Board of Supervisors recognizes the concern of the Tucson-Pima County Historical Commission for the need of adequate documentation and professional preservation of the city-county's historical and archaeological sites as required by law, and

WHEREAS, the Pima County Board of Supervisors recognizes the need to facilitate coordination and promote efficiency in documentation, recovery, or preservation of historical or archaeological sites, and

WHEREAS, the Board of Supervisors desires to promote the highest degree of cooperation in archaeological or historic preservation matters between the Board of Supervisors, the Mayor and Council, the State Historic Preservation office, and other affected divisions of city, county, state, and federal government, and

WHEREAS, the need for professional archaeological and historic services are intermittent and unforeseeable.

NOW, THEREFORE, LET IT BE RESOLVED by the Pima County Board of Supervisors as follows:

Section 1. The Pima County Board of Supervisors will contract for the services of a professional archaeologist or similarly qualified agency to review and recommend action for all known archaeological or historic sites that are impacted by any construction project funded by or under the direction of Pima County.

Section 2. The Pima County Board of Supervisors will cause a review to determine the need for professional archaeological services if there exists a possible archaeological preservation site for any Pima County funded planned construction.

Section 3. The Pima County Board of Supervisors will cause the cessation of any Pima County funded project in the vicinity of an archaeological or historic site for the length of time necessary for documentation, recovery, or preservation if it is determined during the construction of such project that the archaeological or historic site will be endangered or destroyed.

DONE this 24th day of May, 1983.

PIMA COUNTY BOARD OF SUPERVISORS

By _____
Sam Lena, Chairman

ATTEST:

_____
Eugenia Wells, Clerk

APPROVED AS TO FORM:

_____
Deputy County Attorney

ANTIQUITIES ACT

ENFORCEMENT GUIDELINES

Definitions

An archaeological site is any place with material evidence of past human behavior. This includes sites which do not have any walls or other architecture, such as burial grounds, potsherd scatters, chipped stone scatters, and rock art sites.

The law does not specify how old an archaeological site has to be to be covered under the law. A 100 year old limit is probably a good rule of thumb, but the law could conceivably apply to any site which has been abandoned. A ruin need not be prehistoric to be protected by the law.

A paleontological site is a locality at which fossilized animal or plants are found. The law is particularly explicit about vertebrate paleontological sites, sites at which fossilized remains of vertebrates (animals with backbones) are found. The law also protects fossilized footprints (dinosaur tracks).

State land includes land owned or controlled by the state of Arizona, or any agency thereof. This is interpreted to include county and municipal land. Lands leased from the state are state lands on which the antiquities act applies in full.

ARS SS 41-841, 41-842, 41-846 and S 13-3702.01

Pursuant to these ARS Sections:

1. It is a felony to do any excavation on an archaeological or paleontological site on state land without a permit issued by the Arizona State Museum (ASM).

   A. Excavation is any kind of ground disturbance. In addition to digging holes in the ground, burrowing into arroyo cuts or removing rock art from a cliff is prohibited.

   B. Common tools used in excavations include probes, shovels, and backhoes.

2. It is a misdemeanor to collect any archaeological specimen from the surface of the ground on state lands without a permit issued by the ASM.

   A. Archaeological specimens include items resulting from past human life and activities, including: pottery, human skeletal material, jewelry, rock art, textiles, weapons, wooden items, and grinding stones as well as historical items one hundred or more years old.

B. Excluded from the prohibition on collecting are items less than 100 years old, and all arrowheads, coins and bottles, no matter what their age. Arrowhead is interpreted to mean any well fashioned piece of chipped stone.

3. It is a misdemeanor to deface any archaeological or paleontological site on state land without a permit issued by the ASM.

4. Any material illegally obtained under this act and all records and photographs connected with this material are forfeited to the Arizona State Museum.

ARS § 13-3702

1. It is a misdemeanor to deface or damage in any way a cave, or rock art panel or to disturb plant or animal life in a cave without written permission of the owner. (This is not restricted to state land.)

2. It is a misdemeanor to disturb any barrier designed to prevent entry to a cave or to carry into any cave any kind of paint or coloring agent, without written permission of the owner.

ARS § 41-482

1. Two kinds of permits are issued by the Arizona State Museum: project specific permits, and general permits. The permit forms are illustrated below.

2. All permits name the institution to which the permit is issued and the name and address of the person ultimately responsible.

   A. Project specific permits will also name the person in specific charge of the project.

   B. All permits should be accompanied by a letter or memo on the stationery of the institution to which the permit is issued naming the people authorized to lead investigations under the permit. Each field party must include one such person. Each person so authorized is required to carry a copy of the permit and letter. Thus, any group found in the field should have a permit and an authorizing memo.

3. All permits name the kinds of activity allowed under the permit. Only the activities specifically authorized may be conducted.

   A. Non-collection archaeological survey, does not permit removal of any archaeological specimens (as discussed above) from an archaeological site. Crews doing this will generally only be writing down information and drawing maps. With this kind of permit, no artifacts of any kind, even broken pieces of pottery or small pieces of chipped stone, may be removed from the site.

B. Collecti archaeological survey (or jus rchaeological survey) includes the activities of non-collection archaeological survey, but leaves the crews the option of removing archaeological specimens from the surface of the site for further study. No ground disturbance of any kind is permitted.

C. Archaeological testing allows limited ground disturbance. Testing usually involves fairly small holes (for example, 2 or 3 yards square).

D. Archaeological excavation allows any kind of ground disturbance, including the clearing of large areas with power equipment. However, few excavation permits are issued every year, and most involve areas of projected development.

E. Analogous categories are defined for paleontological investigation which involve paleontological sites and specimens rather than archaeological sites and specimens.

4. All permits include effective dates during which investigations may be conducted.

5. Project specific permits also include a description of the area in which investigations may be made. This will usually be a legal description (township, range and section) but it may reference an attached map. General permits allow activities anywhere on state lands.

6. All permits are on file at the Arizona State Museum and may be quickly accessed. Call 626-1761 and ask for Keith Kintigh or, if there is no answer, call 626-1180 and ask for help. Copies of all permits will be mailed to the Arizona Commission of Agriculture and Horticulture.

Special Investigation & Arrest Procedures

?

Notes

Officers should be be aware that similar protections apply to archaeological sites on federal lands. Archaeological investigation on federal lands requires a permit. If suspicious activites are observed on federal lands, the responsible agency should be notified as soon as possible. If possible, talk to an archaeologist at the agency to insure prompt and appropriate action.

Arizona State Museum archaeologists are available at all times. For assistance call Paul Fish at 626-2556.

ARIZONA GAME & FISH DEPARTMENT

2222 West Greenway Road Phoenix, Arizona 85023 942-3000

555 N. Greasewood Rd. Tucson, AZ 85745 628-5376

February 18, 1986

Greg A. Schuelke
Anderson-Nichols
4120 N. 20th Street
Phoenix, AZ 85016

RE: Highland Wash
Basin Management Study

Dear Mr. Schuelke:

The Arizona Game and Fish Department has reviewed the area of the Highlands Wash Basin Management Plan located in T12s, R13E, sections 1, 2, 11 and 12; T11S, R13E, Sections 13, 14, 23, 24, 25, 26, 35 and 36 and we wish to provide the following information and comments.

The Department's data management system was accessed for the site and the following state special status and special interst species occur in the area; desert tortoise (Gopherus agassizii), Gila monster (Heloderma suspectum, and Harris' hawk (Parabuteo uncinctus). All three species will occur primarily on the upland sites in T11S, R13E, Sections 13, 14, 23, 24, and 25.

Habitat for the three species and other native wildlife can be preserved by considering the following guidelines;

- Retention of Highlands Wash as open space, including retention of native plants.

- Low density zoning and setbacks in the upland desert areas that are near the Tortolita Mountains.

Wildlife values south of Tangerine Road are highest in the drainageways. The above - named species are not recorded in our data management system for T12S, R13E, Sections 1, 2, 11 and 12. However, the larger drainages in these sections do provide values for wildlife that could be retained if the drainages are kept as open space with retention of native plants.

In summary, sensitivity for wildlife decreases from north to south in the study area. Generally, wildlife values are higher north of Tangerine Road. Highlands and Big Wash function as connecting wildlife corridors between the Tortolita Mountains and the Canada del Oro.

Thank you for the opportunity to comment on this study. If we can be of further assistance, contact the Habitat Specialist at 628-5376.

Sincerely,

Bud Bristow, Director

Vashti C. Supplee
Habitat Evaluation Specialist
Tucson Regional Office

VCS:ar

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
AND FLOOD CONTROL DISTRICT

1313 SOUTH MISSION ROAD • TUCSON, ARIZONA 85713
TELEPHONE • (602) 882-2667

C. H. Huckelberry, P.E. P.E.
DIRECTOR

May 24, 1982

Kewin Enterprises, Inc.
332 West Matterhorn Street
Tucson, AZ 85704

Re: The Highlands Subdivision - Drainage Problem

Attention: Arthur Kewin

Dear Mr. Kewin:

Our June 12, 1981 letter advised of our investigations into several potentially hazardous drainage deficiencies which exist within the Highlands Subdivision. We specifically cited the following problems:

1. A sixty foot drainageway east of block 1 has inadequate capacity to carry more than the 10-year flood. The channel was further restricted by vegetation which had grown up within the area intended for passage of storm water.

2. The dikes along the north side of the subdivision were found to be too low in some places and requiring stabilization in other places.

3. Erosion and flooding from adjacent hills has created a problem along the east side of the development. The drainage easement platted along the east side of the subdivision was never constructed to carry anticipated storm waters.

The only corrective action that we are aware of as a result of our previous letter is the removal of vegetation in the sixty foot drainageway east of block 1. The inadequate overall capacity of this drainageway and the other two items brought to your attention in our previous letter were not addressed. The primary reason given for not dealing with either of these two problems was the contention that necessary