Safari Highlands Ranch
CEQA Drainage Study

W.O. 2374-017

Escondido, California

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1. Introduction

1.1. Scope of Work

The purpose of this study is to provide preliminary hydrology calculations in support of a proposed residential development in the City of Escondido, California. This report will quantify runoff for the 100-year frequency storm event and address flood attenuation to ensure downstream conveyances will not be affected due to this development as well as recommend on-site storm drain infrastructure needed to safely convey stormwater through the site for a 50-year frequency storm. Treatment of stormwater runoff from the site has been addressed in a separate report entitled "Stormwater Management for Safari Highlands" prepared by this office. That report also addresses the hydromodification management requirements.

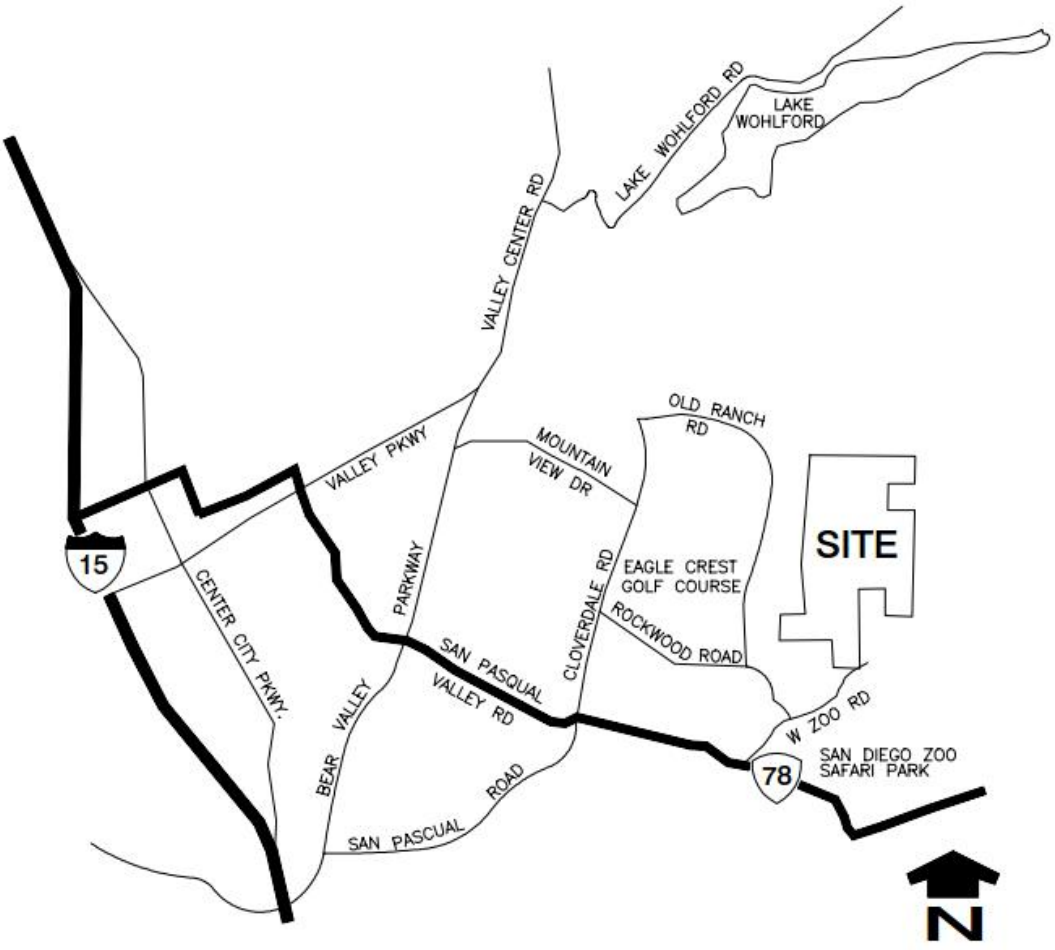
1.2. Project Description

The proposed project is a 1,100 acre site located in the Valley View area within the City of Escondido, north of Highway 78/San Pasqual Valley Road and the San Diego Zoo's Safari Park, and approximately 7 miles east of the I-15 and SR-78 intersection. An existing golf course/ residential community (Eagle Crest Golf Course/ Rancho San Pasqual Development) and another small (79 lot) residential community (Rancho Vistamonte) are located to the west and south. In the distant vicinity lies Lake Wohlford to the northwest. Rural single family residences on hilly terrain, dirt roads and trails are found to the east. The property obtains access from Rockwood Road, between the golf course and Rancho Vistamonte development. Refer to the project Vicinity map on the next page.

According to the FEMA Flood Insurance Rate Map (FIRM) for this site, the project is located within two FIRM panels (06073C1101G and 06073C0850G). FIRM Panel 06073C0850G shows the project site in an unshaded Zone X, which is defined as "Areas determined to be outside the 500-year floodplain". FIRM Panel 06073C1101G is an unprinted map. According to FEMA this means that no physical FIRM panel was printed for this area and typically FEMA uses the non-printed panel designation when the area is entirely located within a single flood zone. Since the surrounding panels show Zone X, it can be assumed that this portion, as well as the entire site, is located within the unshaded Zone X. Refer to the FIRM Map in **Appendix 2**.

A Geologic Reconnaissance Study has been prepared for the Safari Highlands Ranch Project by Geocon, Inc. on June 27, 2014. According to this report the site consists of rocks, alluvium and topsoil/colluvium consisting of loose, silty to clayey sand. Additionally, the Natural Resources Conservation Service Web Soil Survey (NRCS) has been used to determine the soil characteristics for this project for this stage of the project. According to the NRCS, the project consists of several soil types, most predominantly Cieneba rocky coarse sandy loam (CmE2) and Cieneba very rocky coarse sandy loam (CmrG). Both have a hydrologic soil rating of Type D. Type "D" soils are described as a having very low infiltration rate. Considering both of the above

soil analyses, Type D soils have been assumed for hydrologic analysis in this study. Refer to **Appendix 2** for complete soils information.



VICINITY MAP

NOT TO SCALE

1.3. Existing Condition

The project site currently consists of approximately 1,100 acres of mostly undeveloped natural open space, a portion of Zoo Road crossing the site at the lower south end of the project site. Topographically, the site consists of rugged, steeply sloping, hillside terrain with occasional, somewhat level valleys. Elevations across the overall property vary from approximately 400 feet in the southwest corner to a high of almost 1,800 feet in the northeast portion of the site.

There are no existing storm drain features onsite. A ridgeline that spans from approximately 3,800 feet offsite from the eastern project boundary that runs through the

project site separates the site into two drainage areas, to be referred to as **Drainage Area A** (the north) and **Drainage Area B** (the south). The two drainage areas flow across the site in a northeast to southwest direction.

Drainage Area A, consists of approximately 412 acres in the northern portion of the site. The summit of the drainage area is located just north of the project boundary at an elevation of 1,765 feet. From there, runoff is conveyed southwesterly through a series of natural valleys that converge and eventually cross the western project boundary approximately 3,000 feet south of the northern boundary. Runoff continues from there southwesterly across undeveloped terrain and in natural valleys directly east of Rosewood Lane (a residential cul-de-sac within the Eagle Crest Golf Course/ Rancho San Pasqual development). This drainage course continues southwest and crosses under Old Ranch Road through an existing culvert and then discharges to the west within the golf course. From there runoff is conveyed southwest through the golf course, crosses under Rockwood Road west of San Pasqual Union Elementary School and continues south joining the San Dieguito River.

Drainage Area B, spans approximately 1,925 acres. The summit of the drainage area is approximately 4,700 feet northeast of the corner of the project boundary at an elevation of 1,880 feet. Runoff from this offsite area is conveyed southwesterly through a series of natural valleys and discharges at the southern end of the project site, flowing towards Rancho Vista Monte. Drainage Area B will then confluence with Drainage Area A after flowing past The San Pasqual Union Elementary School.

1.4. Proposed Condition

Development of the site will include 550 residential lots of various sizes in 7 neighborhoods, multi-purpose basins throughout the site, along with associated streets, sidewalks, and internal storm drainage systems. Safari Highlands Ranch Road will connect to the existing Rockwood Road and extend through the site to provide access to all of the neighborhoods. A fire station and private recreation facility will be developed in the southeastern portion of the site near the gated entry to the residential neighborhoods.

The proposed drainage patterns will remain the same as the existing condition with drainage areas A and B maintaining the same two points of discharge. Drainage Area A consists of 2 neighborhoods with half acre and 1 acre lots and is approximately 402 acres. Drainage Area B is approximately 1,958 acres and includes the remaining 5 neighborhoods with 7,000 to 9,900 square foot pads as well as the fire station and recreation facilities. The development is generally situated throughout the site and preserves the natural drainage courses within the tributary areas. Offsite drainage areas entering the site will be conveyed through the development to their original points of discharge on the west side, typically crossing under proposed roads in culverts. Some offsite drainage is picked by a series of brow ditches and/or separate storm drain system that will convey the runoff around the development to discharge into each tributaries natural conveyance channel. Calculation for proposed ditches and storm will be provided during final engineering, sizing these to convey the stormwater with

adequate freeboard. Runoff from the developed areas will be routed to the streets and conveyed via curb and gutter until it reaches curb inlets and intercepted by storm drain inlets. Each storm drain system is routed to multi-purpose basins proposed throughout the site. These basins will provide water quality treatment, hydromodification management and flood attenuation to treat and release urban runoff at peak flow rates at or below existing conditions. Rip rap or other energy dissipaters will be positioned at outfall locations in order to mitigate discharge velocities.

Development also includes offsite improvements to Old Guejito Grade Road on the northwest for use as an emergency access road. The existing road will be widened, regraded and realigned in some areas to accommodate passage of emergency vehicles. The runoff from upstream drainage areas will be allowed to flow across the road through culverts at two locations.

The Natural Resources Conservation Service (NRCS) Unit Hydrograph Method will be used as both drainage areas are in excess of 0.5 square miles and will be used to analyze the watershed in both pre and post development condition. The HEC-HMS analysis was subdivided to include the routing of the developed flow through the detention basins to account for peak flow attenuation. Methodology, presented in Section 2 of this report, is consistent with standards set forth in the County of San Diego's Hydrology Manual and City of Escondido's Design Standards.

2. Methodology

2.1. NRCS Unit Hydrograph Hydrologic Analysis

The Natural Resources Conservation Service (NRCS) Unit Hydrograph is necessary for hydrologic analyses of watershed areas approximately 0.5 square mile and greater in size. The HEC-HMS Version 4.1 program was used to produce 100-year, 24-hour hydrographs and peak flow rates at various points of interest for existing and proposed conditions. HEC-HMS, developed by the United States Army Corps of Engineers' Hydrologic Engineering Center, simulates the surface runoff response of a watershed to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components.

The NRCS Unit Hydrograph calculations and input parameters follow the guidelines in Section 4 of the 2003 San Diego County Hydrology Manual (SDCHM). The input that was required to produce the hydrographs included rainfall depth, rainfall distribution, drainage basin area, precipitation loss data, and data to determine overland and channel routing information. Output from the model is presented in the form of hydrographs, which are curves relating runoff flowrates to elapsed time from the beginning of rainfall. Thus, the distribution of the entire runoff response is available for analysis. The following sections discuss the parameters and assumptions specified within the analyses.

2.1.1 Basin Delineation

Existing Condition Drainage Area A

The watershed is approximately 0.7 square miles and was divided into 6 subareas based on terrain and gradient changes. The discharge point is at node J03 as it encompasses the whole drainage area for the proposed Safari Highlands' northern neighborhood. It will also be the point of comparison for the 100-year discharge.

Existing Condition Drainage Area B

The studied watershed is approximately three square miles and was divided into seven subareas based primarily upon gradient changes along the main flow path. The most downstream node (J07) is located near the downstream face of the Rockwood Road culvert and was chosen such that it encompasses the entirety of the proposed Safari Highlands impacts to the watershed of interest. Consequently, this node is designated as the location to which the proposed 100-year discharge will be compared.

Existing Condition Drainage Area Offsite (Northeast, North, and Northwest)

The studied watershed is approximately six square miles and was divided into 3 watershed areas, Northeast, North, and Northwest based on the topography.

Northeast is composed of the area just to the northwest of the most northwestern part of the project boundary. It sits in between 2 ridges and a saddle. The most downstream node (J2) is located downstream of an existing dirt road named Stronebridge Rd. This area was chosen as it encompasses the entirety of the proposed access road that is to provide access from Safari Highlands Ranch. This is also where the 100-year discharge will be compared.

The North watershed is the largest of the offsite drainage areas, comprising of 5.5 square miles. It includes multiple valleys and ridges that converge at the lowpoint of where the existing dirt road currently is before continuing to flow south to eventually confluence with drainage from the Northeast and Northwest. The North watershed

seven subareas based primarily upon gradient changes along the main flow path. The most downstream node (J07) is located near the downstream face of the Rockwood Road culvert and was chosen such that it encompasses the entirety of the proposed Safari Highlands impacts to the watershed of interest. Consequently, this node is designated as the location to which the proposed 100-year discharge will be compared.

Proposed Conditions Drainage Area A

The existing conditions subareas were modified to incorporate the proposed development. This included subarea delineations to calculate peak flow rates at four culverts. Additionally, subareas within the development were delineated based upon the tributary area to each detention basin as inflow hydrographs were needed for storage routing.

Proposed Conditions Drainage Area B

The existing conditions subareas were modified to incorporate the proposed development. This included subarea delineations to calculate peak flow rates at six culvert crossings. Additionally, subareas within the development were delineated based upon the tributary area to each detention basin as inflow hydrographs were needed for storage routing.

It should be noted that the southeastern corner of Basin I assumes that the proposed/improved roadway diverts runoff from an adjacent hillside, thus excluding it from the calculations. This is a slight discrepancy from the same location in the existing conditions model where the runoff from this hillside was included as part of the subarea due to the assumption of flow over the existing roadway.

Proposed Condition Drainage Area Offsite (Northeast, North, and Northwest)

The 3 watershed areas in existing condition, Northeast, North, and Northwest based on the topography will drain similar to existing conditions. The runoff will be

The proposed emergency access road

The North watershed is the largest of the offsite drainage areas, comprising of 5.5 square miles. It includes multiple valleys and ridges that converge at the lowpoint of where the existing dirt road currently is before continuing to flow south to eventually confluence with drainage from the Northeast and Northwest. The North watershed

2.1.2 Precipitation Data

The precipitation data for this study consisted of the 100-year, 6-hour and 24-hour values from the SDCHM isopluvials (see Attachments). The values were interpolated for their use in the model and checked to verify that the 6-hour to 24-hour ratio was between 45 percent and 65 percent.

The point precipitation values are as follows:

$P_{100\text{-}6}$ = 3.6 inches

$P_{100\text{-}24}$ = 8.0 inches

To generate 24 hours of rainfall data at 5 minute intervals, these values are interpolated based upon the Rational Method intensity equation in the SDCHM up to the 6 hours and from log-log interpolation between 6 and 24 hours. They are then adjusted based upon depth-area factors presented in the SDCHM. Finally, the incremental ordinates are calculated and ordered based upon a 2/3, 1/3 distribution. The resulting output hyetographs are manually entered into the HEC-HMS program as part of the meteorological component.

2.1.3 Loss Rates

The curve number method was used in this study to account for precipitation losses. This method was developed by the NRCS and is based on hydrologic soil type and land use. Curb numbers describe runoff conditions. A larger curve number indicates a larger percentage of impervious cover, thus increasing runoff potential. Conversely, a lower curve number indicates a lower runoff potential. Curve numbers are related to storage within the watershed, which is a primary component of excess runoff.

Existing Conditions

The curve number selected for undeveloped portions of the watershed was 85 (Table 4-2 of the SDCHM). This was based upon a land cover of Herbaceous (mixture of grass, weeds, and low-growing brush), 'Good' hydrologic conditions (75 percent or more of coverage), and Type D soil.

In Drainage Area B, subarea EXSH906, the Rancho Vistamonte residential development encompasses approximately 25 percent of the subarea. Assuming 1/3-acre lots, Table 4-2 in the SDCHM indicates the curve number should be 86 for Type D soils. When this area weighted with the undeveloped portion of the subarea, the composite curve number is approximately 85.3

Once the composite curve numbers are calculated for each subarea, they are adjusted based upon the Precipitation Zone Number (PZN). The curve numbers listed within Table 4-2 of the SDCHM are for PZN 2.0, and based upon the watershed location, the actual PZN is 2.0 (see Attachments). So for this location, the PZN adjustment is not needed. Additional adjustments were then made based upon the design storm frequency (Table 4-6 of the Manual). For this project, a PZN of 3.0 was used for the 100-year event. The final curve numbers are then calculated using Table 4-10 of the SDCHM. This resulted in 94 being specified for all subareas.

Proposed Conditions

Curve numbers for the proposed conditions were calculated in the same manner as existing conditions. The principal cover types of Herbaceous (curve number equal to 85) for the undeveloped areas, 1/3-acre residential for the existing Rancho Vistamonte development (curve number equal to 86), and 1/4-acre residential (curve number equal to 87) for the proposed Safari Highlands development were area weighted within each subarea to calculate a composite curve number for PZN 2.0. They were then adjusted to PZN 3.0 to determine the final curve number used in the model. The results for each subarea can be seen in Table 1, below:

Drainage Area A Proposed Conditions

Subarea	**$CN_{2.0}$**	**$CN_{3.0}$**
PRSH01	85	94
PRSH02	85	94
PRSH03	85	94
BASIN D	87	95
PRSH04	85	94
BASIN C	87	95
PRSH05	85	94
BASIN F'	87	95
PRSH06	85	94
BASIN B	87	95
PRSH07	85	94
PRSH08	85	94
PRSH09	85	94
BASIN A	87	95
PRSH10	85	94
PRSH11	85	94

Drainage Area B Proposed Conditions

Subarea	**$CN_{2.0}$**	**$CN_{3.0}$**
PRSH01	85	94
PRSH02	85	94
PRSH03	85	94
PRSH04	85	94
BASIN F	87	95
PRSH05	85	94
PRSH06	85	94
BASIN E	87	95
PRSH07	85	94
PRSH08	85	94
PRSH09	85	94
BASIN G	87	95
BASIN H	87	95
PRSH10	85	94
PRSH11	85	94
BASIN I	87	95
PRSH12	85	94
PRSH13	85	94
PRSH14	85	94
BASIN K	95	98
PRSH15	85.3	94
PRSH16	85	94

Drainage Area C Proposed Conditions

Subarea	$CN_{2.0}$	$CN_{3.0}$
PRSH01	85	94
PRSH02	85	94
BASIN 1	85	95

Drainage Area D Proposed Conditions

Subarea	$CN_{2.0}$	$CN_{3.0}$
PRSH01	85	94
PRSH02	85	94
PRSH03	85	94
PRSH04	85	94
PRSH05	87	94
PRSH06	85	94
PRSH07	85	94
BASIN 2	87	95
PRSH08	85	94
BASIN 3	85	95

Drainage Area D Proposed Conditions

Subarea	$CN_{2.0}$	$CN_{3.0}$
PRSH01	85	94
PRSH02	85	94
PRSH03	85	94
PRSH04	85	94
PRSH05	85	94
PRSH06	85	94
PRSH07	85	94
PRSH08	85	94
PRSH09	85	94
PRSH10	85	94
PRSH11	85	94
PRSH12	85	94
BASIN O-O	85	95
BASIN O-P	85	95
BASIN O-Q	85	95
BASIN O-R	85	95
BASIN O-S	85	95

2.1.4 Unit Hydrograph

The transform used to convert excess precipitation to direct runoff in this model is the NRCS dimensionless unit hydrograph. The NCRS lag time is the required input for this unit hydrograph and is defined as the time from the center of mass of excess rainfall to the peak of the unit hydrograph. The sub-basin Corps lag times are calculated using the equation below from measurable watershed characteristics:

$$Lag_{corps} = 24n((L \times L_c)/s^{0.5})^m$$

where:
- L = length of longest watercourse (miles)
- L_c = length along longest watercourse measured upstream to a point opposite the sub-basin centroid (miles)
- s = overall slope of drainage area between the headwaters and the collection point (feet/mile)
- m = a constant determined by regional flood reconstitution studies equal to 0.38
- n = average of the Manning's n-values of sub-basin watercourses and tributaries

The NRCS lag is related to the Corps lag using the following relationships from the Manual:

$$Lag_{NRCS} = T_p\text{-}D/2$$
$$T_p – 0.862*Lag_{corps}$$

where:
- T_p = Time to peak
- D = Period of effective rainfall (Computation interval equal to 1 minute)

Roughness coefficients were primarily determined form aerial photography. Average roughness coefficients varied from approximately 0.05 in the undeveloped portion of the watershed to 0.018 in the developed areas.

See the 'Lag Calcs' tab within the spreadsheet 'Hydrology Input Values.xls' for the subarea specific values and calculations.

2.1.5 Hydrograph Routing

The Miskingum-Cunge method was selected to route the flood hydrographs through the sub-basins. This method is applicable to the range of slopes that are evident throughout the routing reaches of this watershed. This method is also desirable because it relies on

measurable physical input parameters such as channel slope, reach length, and channel geometry. The only variable that needs to be estimated is the roughness coefficient. A representative channel was specified for each reach to maintain a limit on the model complexity and because modifications are not anticipated to significantly impact the peak discharge results.

See the 'Routing Calcs' tab within the spreadsheet 'Hydrology Input Values.xls' for the subarea specific values and calculations.

2.1.6 Detention Basin Analysis

Detention routing calculations were performed within the proposed HEC-HMS model and were primarily comprised of the inflow hydrograph, stage-storage relationship, and outflow rating curve. The outflow structure (riser) helps attenuate peak discharge values from the proposed developed areas. Consequently, the riser geometry for each detention basin was determined such that at the downstream most confluence node, the peak 100-year discharge value for the proposed conditions (node J11) was equal to or less than the existing conditions (node J06). Please note that freeboard values for each detention basin were not considered as part of these analyses.

The inflow hydrograph was generated within HEC-HMS and was linked to the detention basin node. Based upon the proposed grading, the stage-storing relationship was generated by calculating the area (acres) for each corresponding elevation. The starting ponding condition for each detention basin was set to one foot above the invert to allow for water quality volume. Finally, the outflow rating curve (elevation versus discharge) was developed external to HEC-HMS (see the spreadsheet 'Detention Basin Rating Curves.xls').

The outflow structure at each detention basin was assumed to be a circular riser. Weir flow controlled at lower head elevations, while orifice flow controlled at higher head elevations. The transition from weir flow to orifice flow was assumed at the water surface elevation where the orifice flow produced a comparatively smaller discharge value. Finally, a 25 percent blockage factor was applied to the rating curve assuming that debris caught on the trash rack will reduce the inflow capacity of the riser.

Analysis and Results

Results from the NRCS Unit Hydrograph hydrologic analyses at the downstream comparison locations for Drainage Area A are shown in **Table 1**. These results show increases in the peak 100-year flow rate from the existing to the proposed condition. Drainage Area A proposes 5 detention basins throughout the area to address peak flow mitigation. Detention routing calculations were performed within the proposed HEC-HMS model for this portion of the site. The proposed detention basins mitigate peak flow rates such that at the downstream comparison location, the proposed 100-year, 24-hour discharge rate of 1,624.3 cfs was less than the existing conditions flow rate of 1,684.5 cfs.

Table 1 Drainage Area A

	Node No./ Sub-Basin ID	**Area (SQ. Mi.)**	**Q_{100} (CFS)**
Existing Conditions	J03	0.64	1,684.5
Proposed Conditions	J08	0.62	1,624.3

Results from the NRCS Unit Hydrograph hydrologic analyses at the downstream comparison locations for Drainage Areas B are shown in **Table 2**. Drainage Area B proposes 6 detention basins throughout the area to address peak flow mitigation. Detention routing calculations were performed within the proposed HEC-HMS model for this portion of the site. The proposed detention basins mitigate peak flow rates such that at the downstream comparison location, the proposed 100-year, 24-hour discharge rate of 4,357.6 cfs was less than the existing conditions flow rate of 4,551.6 cfs.

Table 2 Drainage Area B

	Node No./ Sub-Basin ID	**Area (SQ. Mi.)**	**Q_{100} (CFS)**
Existing Conditions	J07	0.64	4,551.6
Proposed Conditions	J12	0.62	4,357.6

Results from the NRCS Unit Hydrograph hydrologic analyses at the downstream comparison locations for Drainage Areas C are shown in **Table 3**. Drainage Area C proposes 1 detention basin throughout the area to address peak flow mitigation. Detention routing calculations were performed within the proposed HEC-HMS model for this portion of the site. The proposed detention basins mitigate peak flow rates such that at the downstream comparison location, the proposed 100-year, 24-hour discharge rate of 442.4 cfs was less than the existing conditions flow rate of 448.7 cfs.

Table 3 Drainage Area C

	Node No./ Sub-Basin ID	**Area (SQ. Mi.)**	**Q_{100} (CFS)**
Existing Conditions	J2	0.12	448.7
Proposed Conditions	J2	0.12	442.4

Results from the NRCS Unit Hydrograph hydrologic analyses at the downstream comparison locations for Drainage Areas D are shown in **Table 4**. Drainage Area D proposes 2 detention basinS throughout the area to address peak flow mitigation. Detention routing calculations were performed within the proposed HEC-HMS model for this portion of the site. The proposed detention basins mitigate peak flow rates such that at the downstream comparison location, the proposed 100-year, 24-hour discharge rate of 7,533.3 cfs was less than the existing conditions flow rate of 7,536.7 cfs.

Table 4 Drainage Area D

	Node No./ Sub-Basin ID	**Area (SQ. Mi.)**	**Q_{100} (CFS)**
Existing Conditions	J05	5.53	7,536.7
Proposed Conditions	J05	5.53	7,533.3

Results from the NRCS Unit Hydrograph hydrologic analyses at the downstream comparison locations for Drainage Areas E are shown in **Table 5**. Drainage Area E proposes 5 detention swales throughout the area to address peak flow mitigation. Detention routing calculations were performed within the proposed HEC-HMS model for this portion of the site. The proposed detention basins mitigate peak flow rates such that at the downstream comparison location, the proposed 100-year, 24-hour discharge rate of 742.0 cfs was less than the existing conditions flow rate of 742.3 cfs.

Table 5 Drainage Area E

	Node No./ Sub-Basin ID	**Area (SQ. Mi.)**	**Q_{100} (CFS)**
Existing Conditions	J05	0.31	742.3
Proposed Conditions	J05	0.31	742.0

Table 6 summarizes the basic hydrologic information and riser dimensions for each detention basin in Drainage Area A.

TABLE 6 DETENTION ROUTING SUMMARY - DRAINAGE AREA A

DETENTION BASIN ID	RISER GEOMETRY (FT.)		PEAK 100-YEAR, 24-HOUR RESULTS				
	WIDTH	HEIGHT	TRIB. AREA (SQ. MI.)	INFLOW (CFS)	OUTFLOW (CFS)	WSEL (FT)	STORAGE (AC-FT)
BASIN A	2X3	2	0.024	119.8	84.2	1588.8	1.6
BASIN B	2X3	6.5	0.053	240.7	138.3	1507.0	7.5
BASIN C	2X3	6	0.037	206.8	110.1	1547.1	7.0
BASIN D	2X3	9.5	0.035	151.5	33.9	1624.2	9.5
BASIN E	2X3	3.5	0.005	28.3	25.0	1589.3	0.6

Table 7 summarizes the basic hydrologic information and riser dimensions for each detention basin in Drainage Area B.

TABLE 7 DETENTION ROUTING SUMMARY - DRAINAGE AREA B

DETENTION BASIN ID	RISER GEOMETRY (FT.)		PEAK 100-YEAR, 24-HOUR RESULTS				
	DIAMETER	HEIGHT	TRIB. AREA (SQ. MI.)	INFLOW (CFS)	OUTFLOW (CFS)	WSEL (FT)	STORAGE (AC-FT)
BASIN F	4	2	0.016	85.4	54.8	1632.2	0.9
BASIN G	3	4	0.083	308.2	156.1	1065.9	6.1
BASIN H	4	2.5	0.031	156.3	97.9	1249.9	2.4
BASIN I	3	2	0.178	580.8	343.7	863.9	14.7
BASIN J	4	3.5	0.014	56.7	36.0	419.9	1.4
BASIN K	4	4.5	0.035	157.3	75.2	1530.9	5.9

Table 8 summarizes the basic hydrologic information and riser dimensions for each detention basin in Drainage Area C.

TABLE 8 DETENTION ROUTING SUMMARY - DRAINAGE AREA C

DETENTION BASIN ID	RISER GEOMETRY (FT.)		PEAK 100-YEAR, 24-HOUR RESULTS				
	WIDTH	HEIGHT	TRIB. AREA (SQ. MI.)	INFLOW (CFS)	OUTFLOW (CFS)	WSEL (FT)	STORAGE (AC-FT)
BASIN O-L	2X3	2	0.002	7.3	6.6	1327.3	0.1

Table 9 summarizes the basic hydrologic information and riser dimensions for each detention basin in Drainage Area D.

TABLE 9 DETENTION ROUTING SUMMARY - DRAINAGE AREA B

DETENTION BASIN ID	RISER GEOMETRY (FT.)		PEAK 100-YEAR, 24-HOUR RESULTS				
	WIDTH	HEIGHT	TRIB. AREA (SQ. MI.)	INFLOW (CFS)	OUTFLOW (CFS)	WSEL (FT)	STORAGE (AC-FT)
BASIN O-M	2X3	2	0.006	12.3	11.3	662.5	0.3
BASIN O-N	2X3	2	0.008	32.7	27.3	522.9	0.4

Table 10 summarizes the basic hydrologic information and riser dimensions for each detention basin in Drainage Area E.

TABLE 10 DETENTION ROUTING SUMMARY - DRAINAGE AREA E

DETENTION BASIN ID	RISER GEOMETRY (FT.)		PEAK 100-YEAR, 24-HOUR RESULTS				
	WIDTH	HEIGHT	TRIB. AREA (SQ. MI.)	INFLOW (CFS)	OUTFLOW (CFS)	WSEL (FT)	STORAGE (AC-FT)
BASIN O-O	2X3	0.5	0.0019	6.1	5.5	1588.8	1.6
BASIN O-P	2X3	0.5	0.0008	3.6	3.4	1507.0	7.5
BASIN O-Q	2X3	0.5	0.0004	1.8	1.8	1547.1	7.0
BASIN O-R	2X3	0.5	0.0004	2.1	2.2	1624.2	9.5
BASIN O-S	2X3	0.5	0.0010	4.6	4.5	1589.3	0.6

These results show that the proposed development of this project will not increase peak flows for any point of discharge. This project will therefore not compromise the capacity of downstream drainage facilities and impacts downstream due to erosion and sedimentation are expected to be minimal to none.

3.1 Culvert Peak Flow Results

There are 13 proposed culvert crossings throughout the site. **Table 11** below summarizes these discharge results and preliminary sizes for the culverts.

TABLE 11 CULVERT DISCHARGE SUMMARY

CULVERT ID	HYDROLOGIC NODE	PEAK 100 YEAR DISCHARGE (CFS)	CULVERT SIZE
DRAINAGE AREA A			
CULVERT 1	J07	92.5	48”
CULVERT 2	J01	431.9	2 X 60”
CULVERT 3	J02	606.6	2 X 60”
CULVERT 4	J03	677.0	2 X 72”
CULVERT 5	PRSH10	94.0	48”
DRAINAGE AREA B			
CULVERT 1	J02	1496.0	2 - 6’ x 7’
CULVERT 2	PRSH03	577.5	6’ x 6’
CULVERT 3	J05	2147.2	2 – 8’ x 8’
CULVERT 4	J07	3,257.8	2 – 8’ x 10’
CULVERT 5	J08	3,857.8	2 – 10’ x 12’
CULVERT 6	J11	4052.1	3 – 8’ X 10’
DRAINAGE AREA C			
CULVERT 1	J1	201.6	60”

TABLE 12 CULVERT DISCHARGE SUMMARY

CULVERT ID	HYDROLOGIC NODE	PEAK 10 YEAR DISCHARGE (CFS)	CULVERT SIZE
DRAINAGE AREA D			
CULVERT 1	J8	4300	3 – 10’ X 12’

Culvert 1 in Drainage Area D is sized for the 10 year storm as the location is at the low point of the emergency access road. The 10 year storm is chosen instead of the 100 year due to the limited use the emergency access road is expected to have.

4. References

Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS). U.S. Army Corps of Engineers, Version 3.5, August 2010.

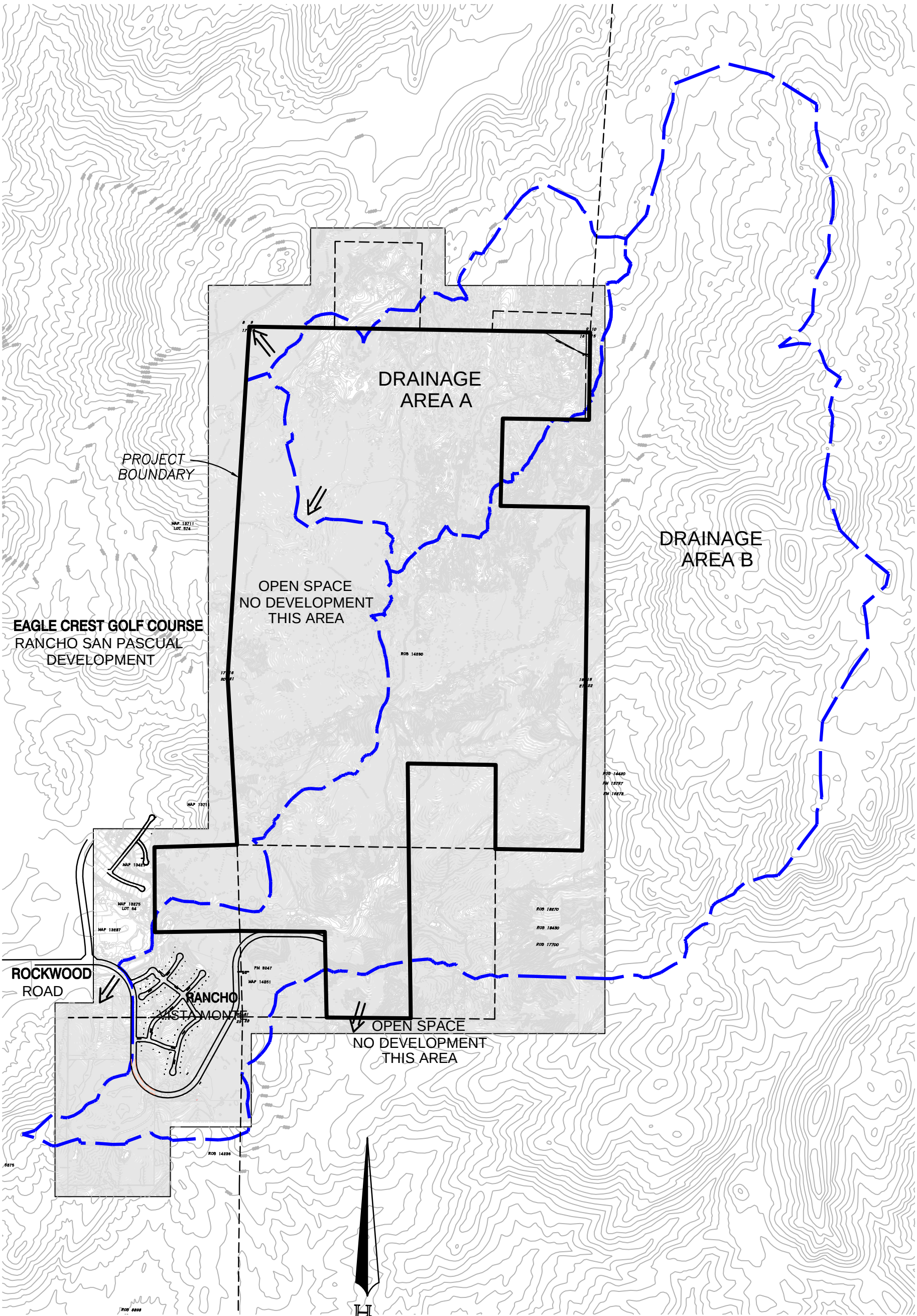
San Diego County Hydrology Manual. County of San Diego Department of Public Works, June 2003.

Safari Highlands Ranch CEQA Preliminary Storm Water Management Plan by Hunsaker & Associates dated December 2014.

Federal Emergency Management Agency, "Flood Insurance Study; San Diego County, California and Incorporated Areas", Revised September 29, 2006.

5. Appendix

Appendix 1 – Project Watershed Map



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& ASSOCIATES
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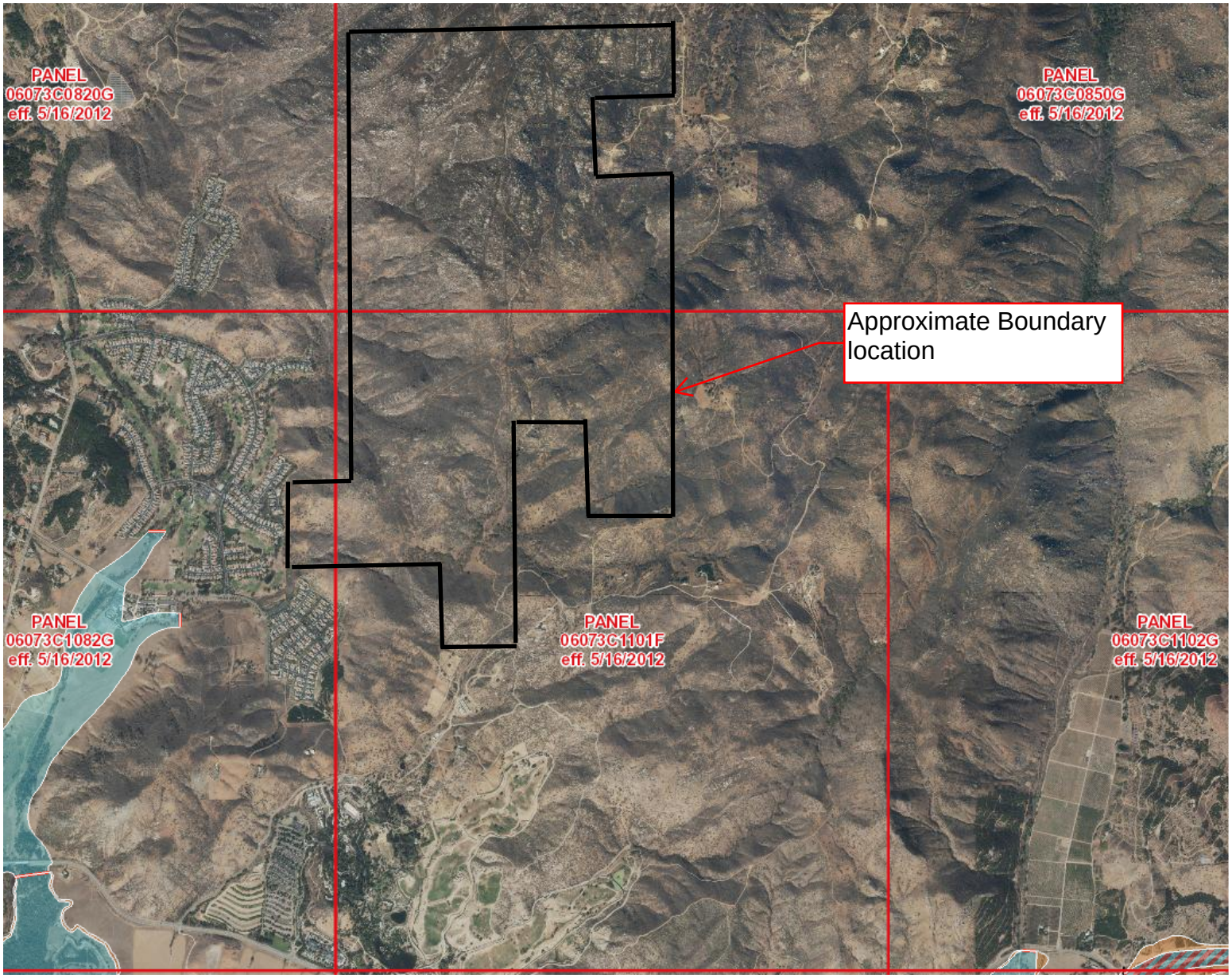
SURVEYING PH(858)558-4500 · FX(858)558-1414

NOT TO SCALE

EXHIBIT 1
SAFARI HIGHLANDS RANCH
PROJECT WATERSHED MAP

R:\1211\&Hyd\ACAD\EXHIBIT 1–Watershed Map.dwg[]Sep–12–2016:15:35

Appendix 2 - FIRM Map



Screenshot taken from FEMA. Property boundary spans a not printed panel. Printed panels provided below.

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

L IS LOCATED
WEST AND THE
ANT.

BOUNDARY

CITY OF ESCONDIDO
060290

CITY OF ESCONDIDO
SAN DIEGO COUNTY

SAN DIEGO COUNTY
UNINCORPORATED AREAS
060284

LIMIT OF STUDY

LIMIT OF STUDY

ZONE A

ZONE X

ZONE X

PROPERTY BOUNDARY

JOINS PANEL 1101

FALLBROOK PL
AMBER OAK LN
OLIVE KNOLL PL
HIDDEN OAKS LN
OLD RANCH RD
PLUM TREE LN
TIMBER CREEK LN
WYNWOOD CT
FERNCREEK LN
ROCKWOOD RD
PUBLIC RD
CITY OF SAN DIEGO
CITY OF ESCONDIDO
QUAIL CREEK PL
MAPLEWOOD PL
SPRUCEWOOD LN
OLD RANCH RD
WALDEN GLEN
VISTAMONTE GLEN
SKYLINE VIEW GLEN
MORNING GLEN TRL
OLD BATTLEFIELD RD
ROCKWOOD
Private Rd
Private
Rd
Sweetwater River
Dieguito River
Private Rd
Sun
19
20
198

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1082G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1082 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESCONDIDO, CITY OF	060290	1082	G
SAN DIEGO COUNTY	060284	1082	G
SAN DIEGO, CITY OF	060295	1082	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1082G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

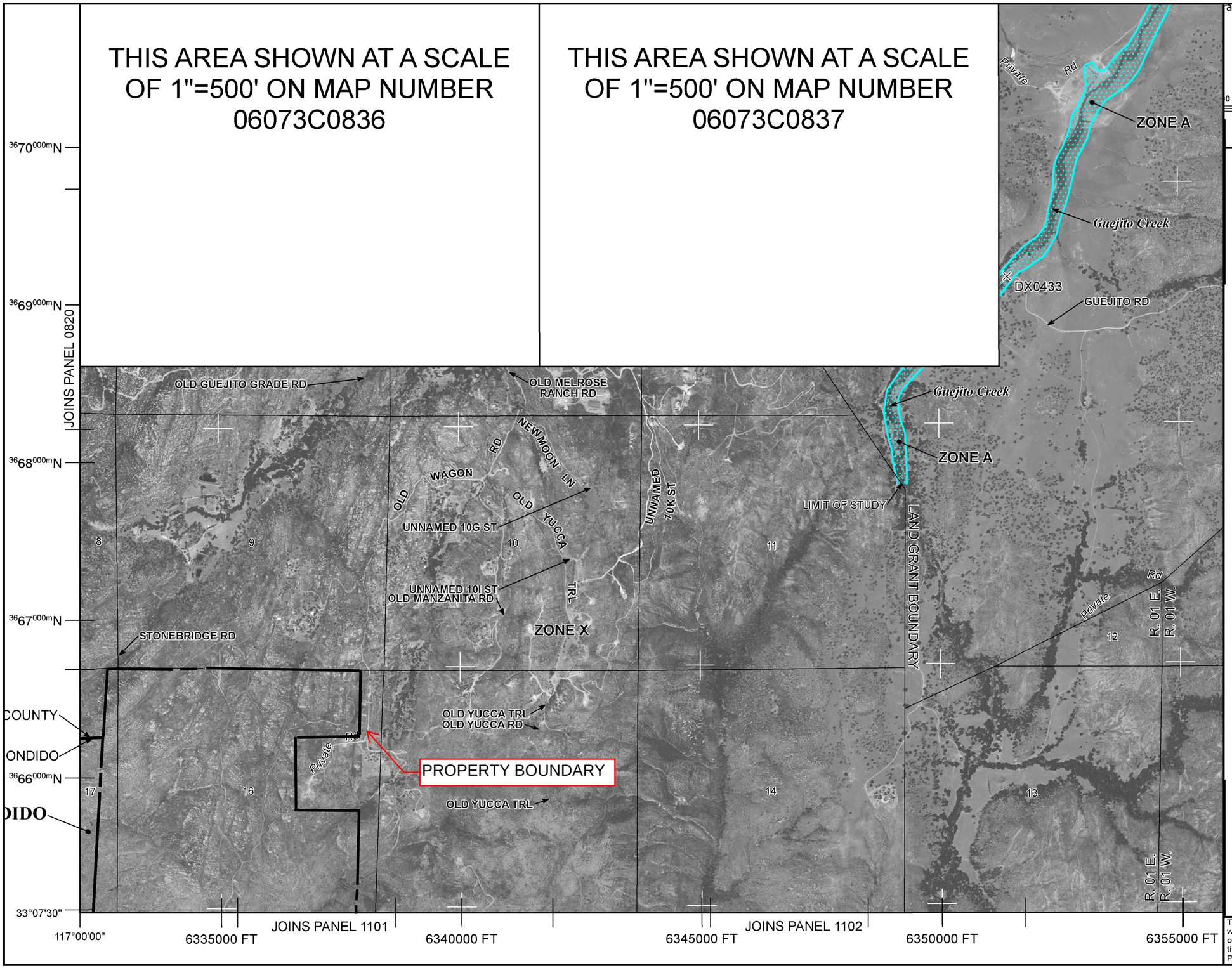
THIS AREA SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 06073C0836

THIS AREA SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 06073C0837

ance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

0 0 1,000 2,000 3,000 4,000 FEET



NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0850G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 850 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESCONDIDO, CITY OF	060290	0850	G
SAN DIEGO COUNTY	060284	0850	G

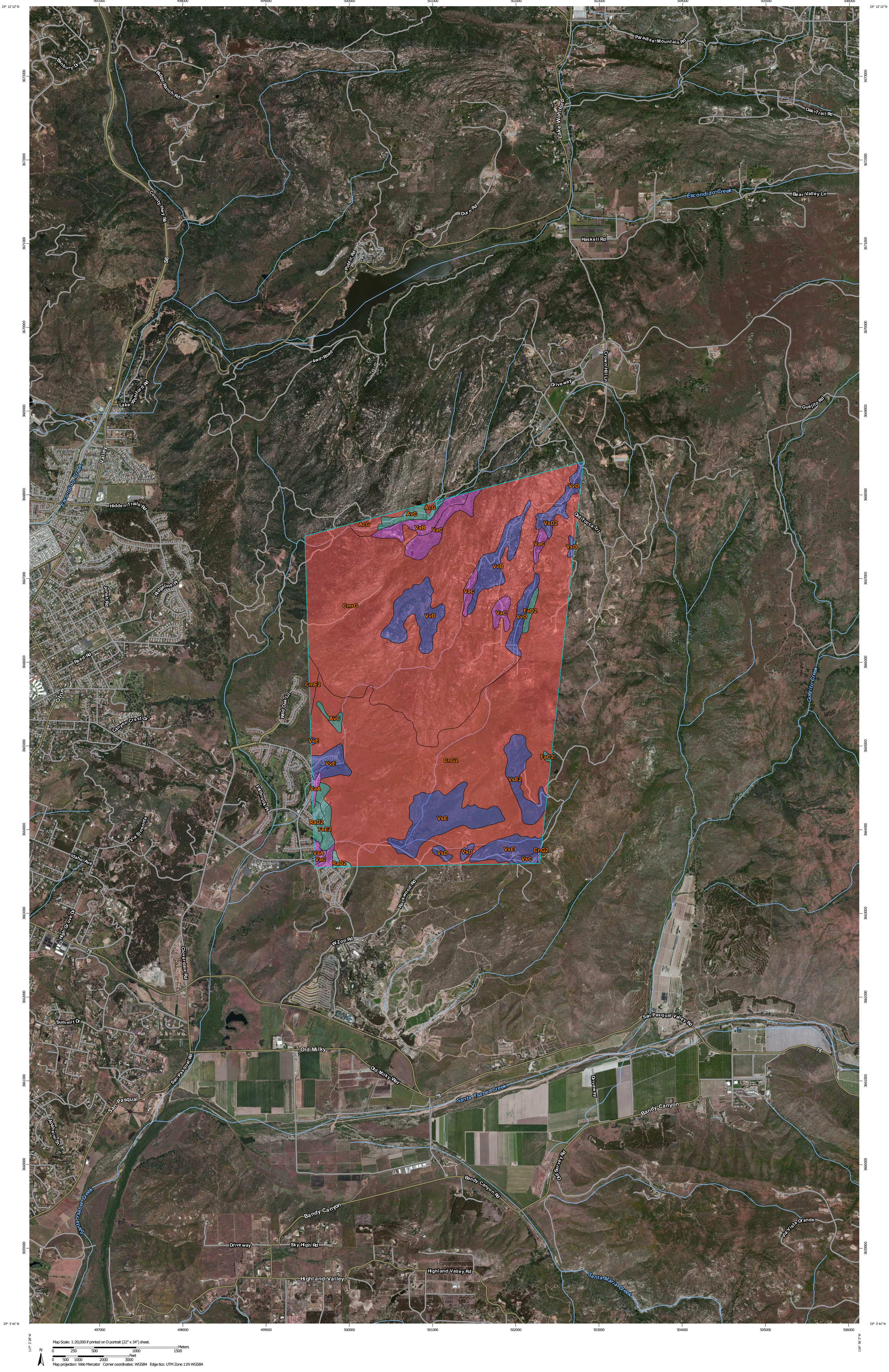
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06073C0850G

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

Appendix 3 – Soils Information



Map Scale: 1:20,000 if printed on D portrait (22" x 34") sheet.

0 250 500 1000 1500 Meters

0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Survey Areas

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 8, Sep 17, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 2, 2010—Jun 7, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AcG	Acid igneous rock land	D	20.8	0.6%
AvC	Arlington coarse sandy loam, 2 to 9 percent slopes	C	31.0	1.0%
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	D	11.8	0.4%
CmrG	Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	D	1,282.5	39.4%
CnG2	Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent s lopes, eroded	D	1,234.4	37.9%
FaC2	Fallbrook sandy loam, 5 to 9 percent slopes, eroded	C	2.2	0.1%
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	8.9	0.3%
FeE2	Fallbrook rocky sandy loam, 9 to 30 percent slopes, ero ded	C	24.9	0.8%
RaD2	Ramona sandy loam, 9 to 15 percent slopes, eroded	C	15.0	0.5%
VaA	Visalia sandy loam, 0 to 2 percent slopes	A	12.6	0.4%
VaB	Visalia sandy loam, 2 to 5 percent slopes	A	37.3	1.1%
VaC	Visalia sandy loam, 5 to 9 percent slopes	A	84.6	2.6%
VsC	Vista coarse sandy loam, 5 to 9 percent slopes	B	7.7	0.2%
VsD	Vista coarse sandy loam, 9 to 15 percent slopes	B	14.8	0.5%
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	B	18.0	0.6%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	B	170.8	5.2%

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
VsE2	Vista coarse sandy loam, 15 to 30 percent slopes, erode d	B	57.8	1.8%
VvD	Vista rocky coarse sandy loam, 5 to 15 percent slopes	B	187.1	5.7%
VvE	Vista rocky coarse sandy loam, 15 to 30 percent slopes	B	33.0	1.0%
Totals for Area of Interest			**3,255.1**	**100.0%**

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix 4 –Hydrology Determination Data

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

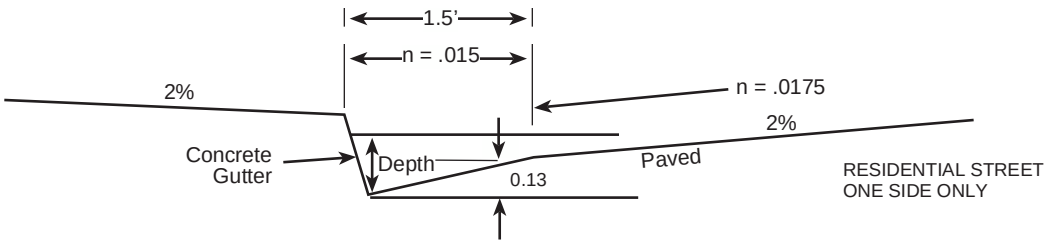
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

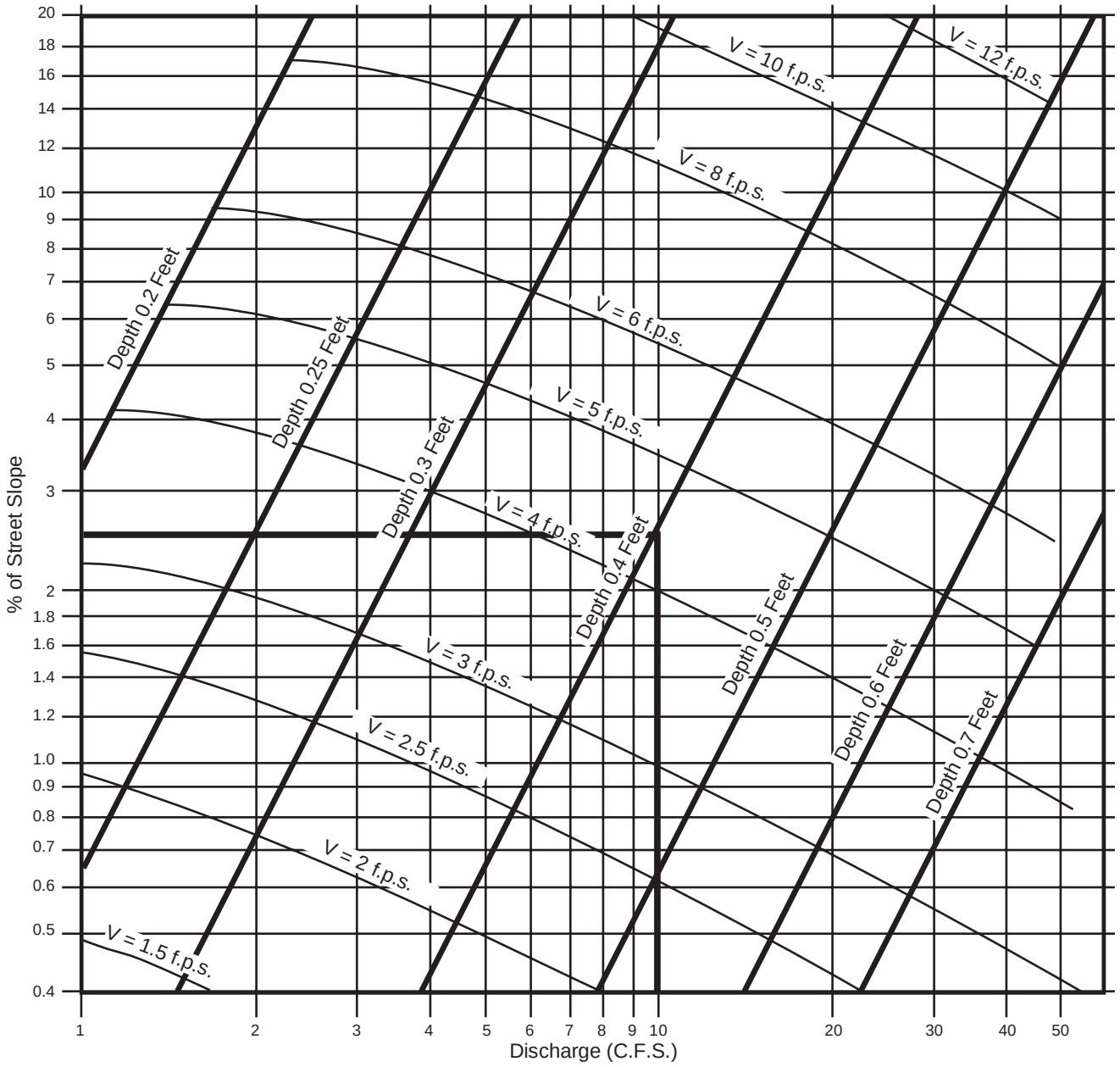
Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description





EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

F I G U R E

Gutter and Roadway Discharge - Velocity Chart

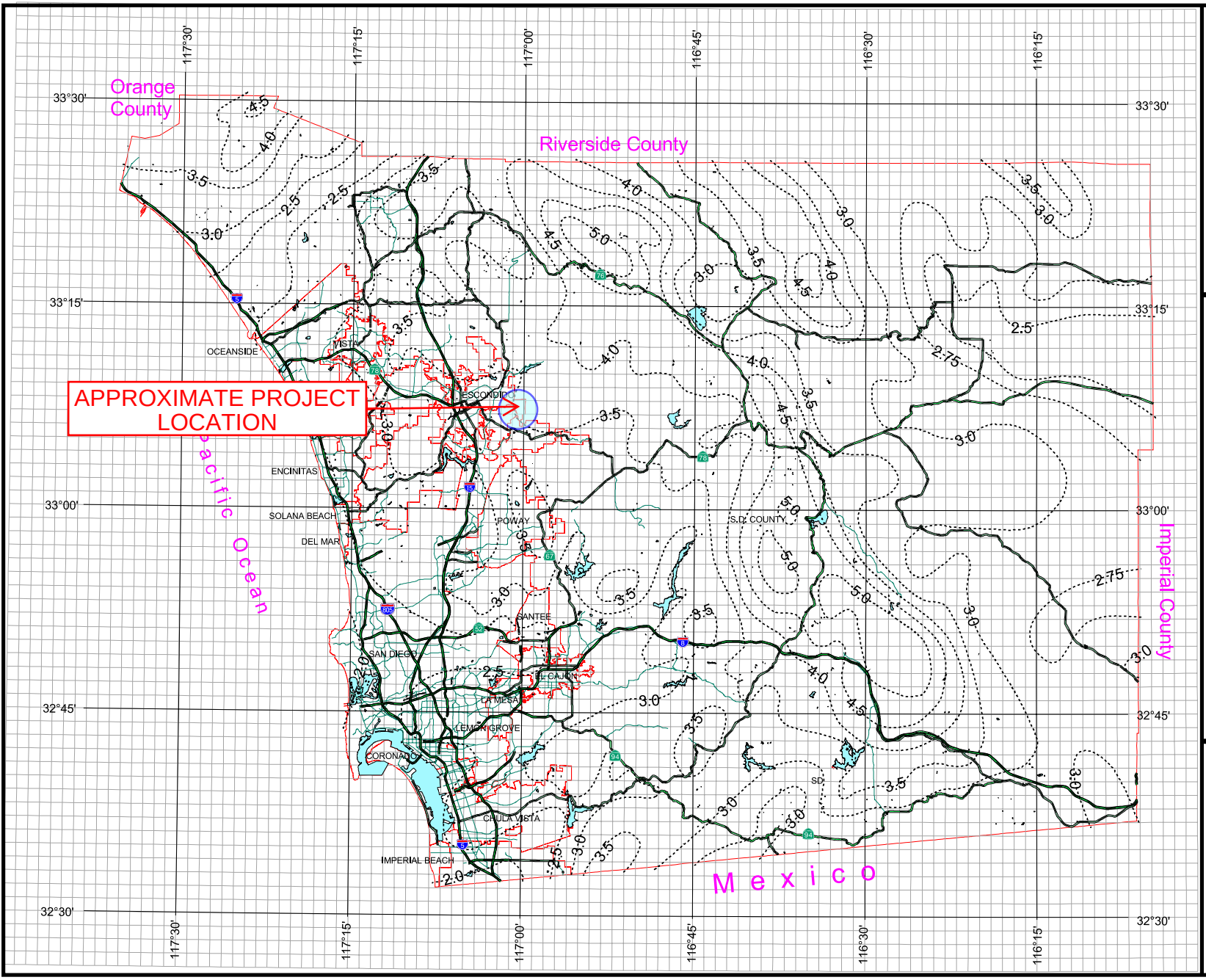
3-6

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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Geographic Information Services

SanGIS
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N
W E
S

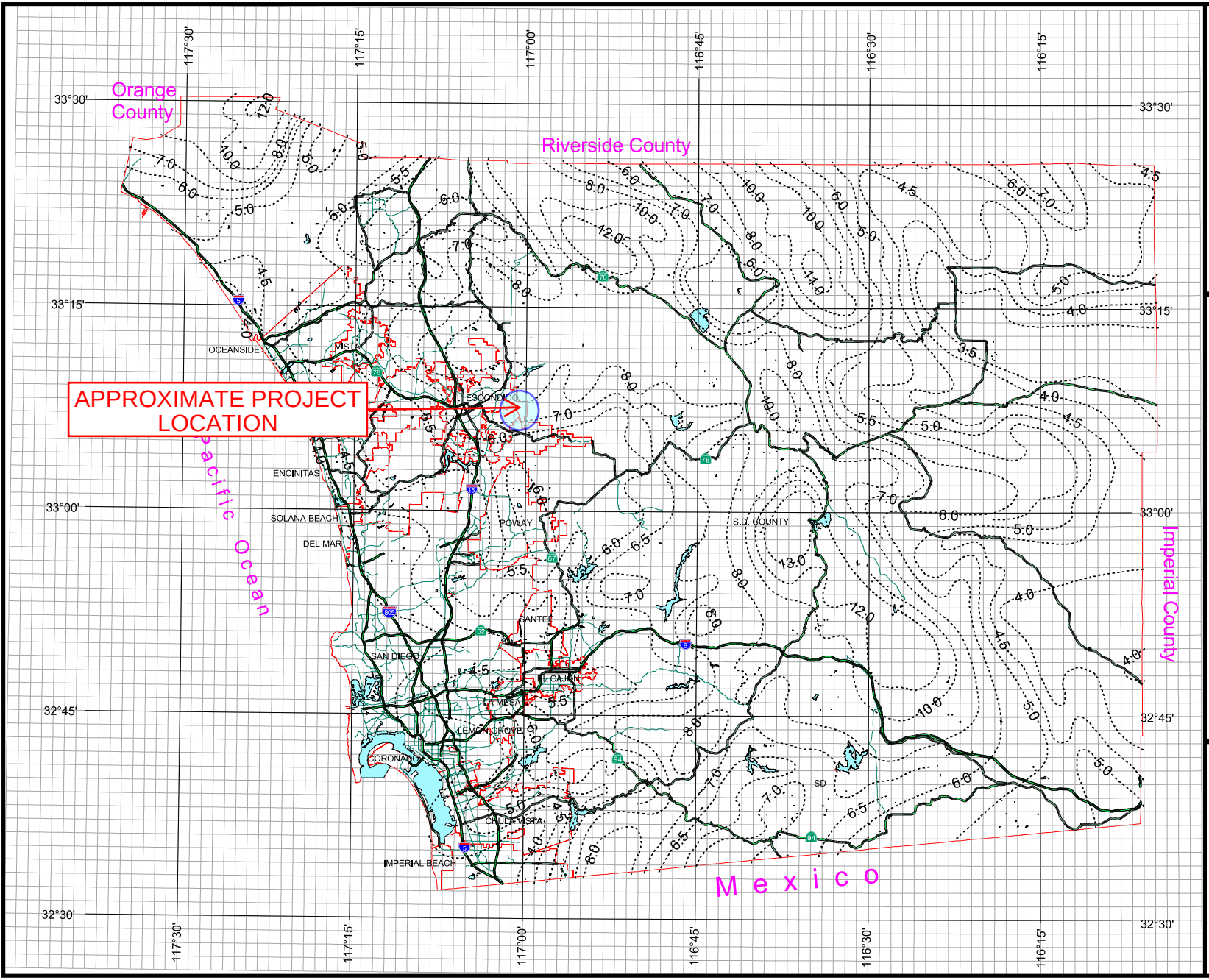
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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S

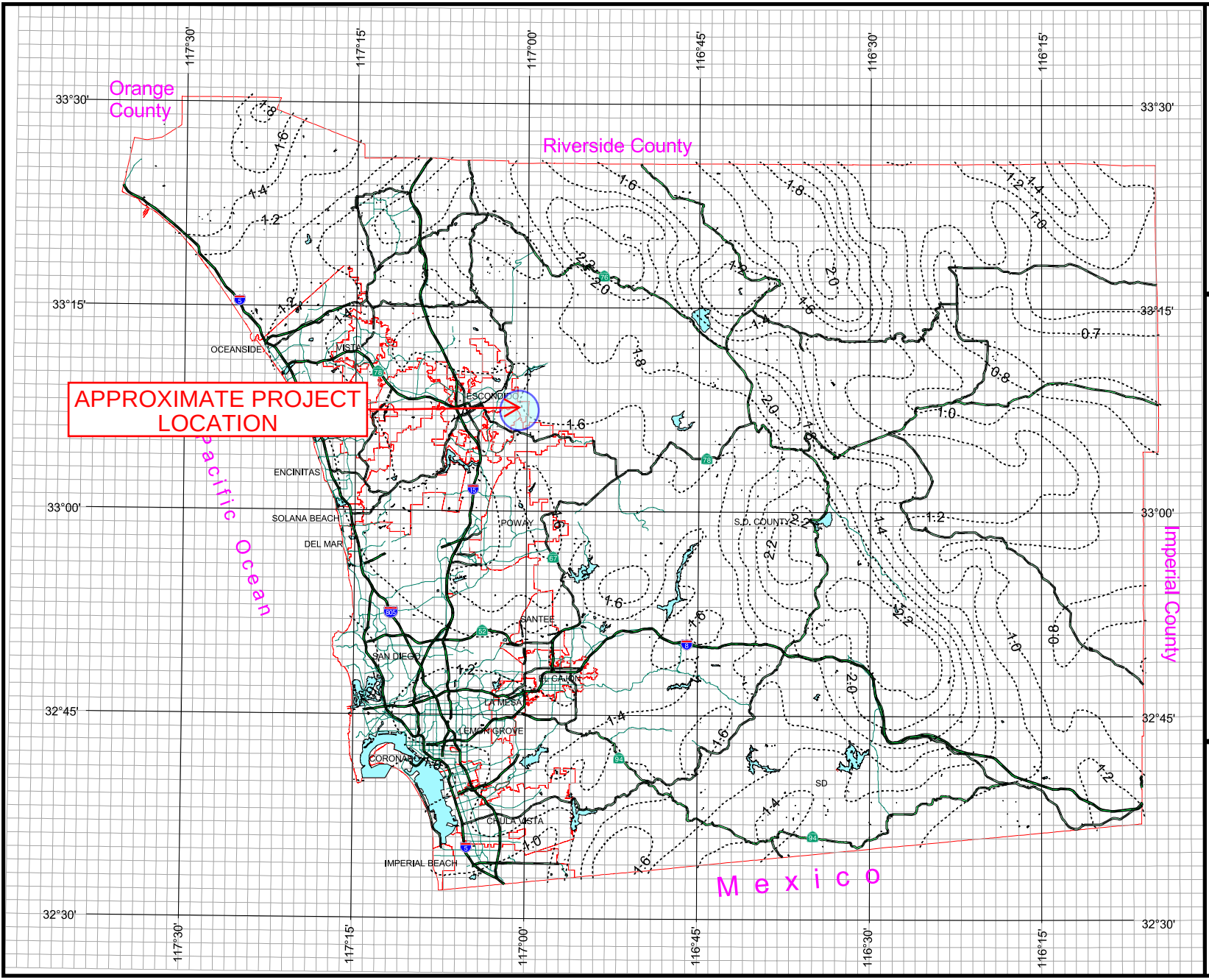
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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W E
S

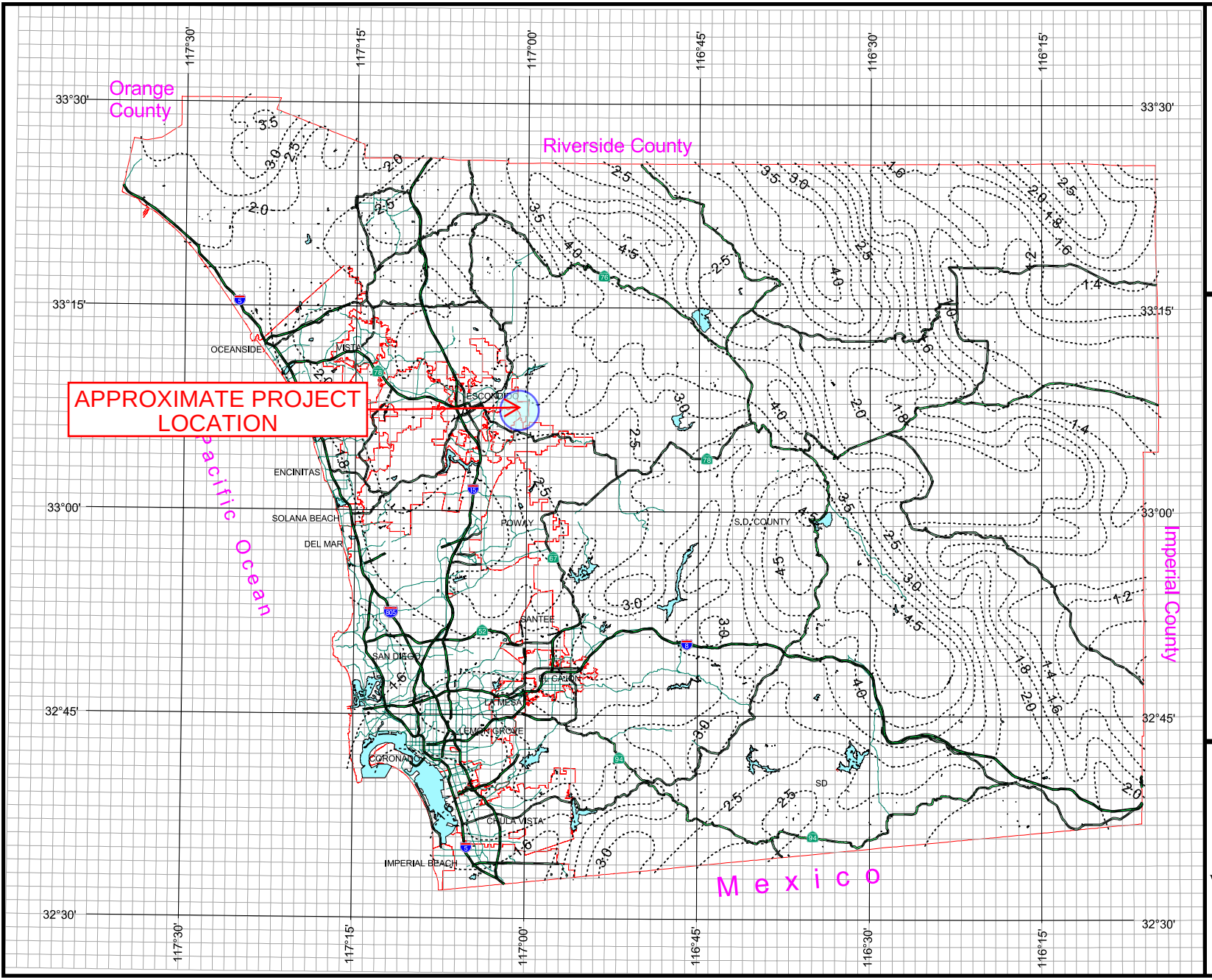
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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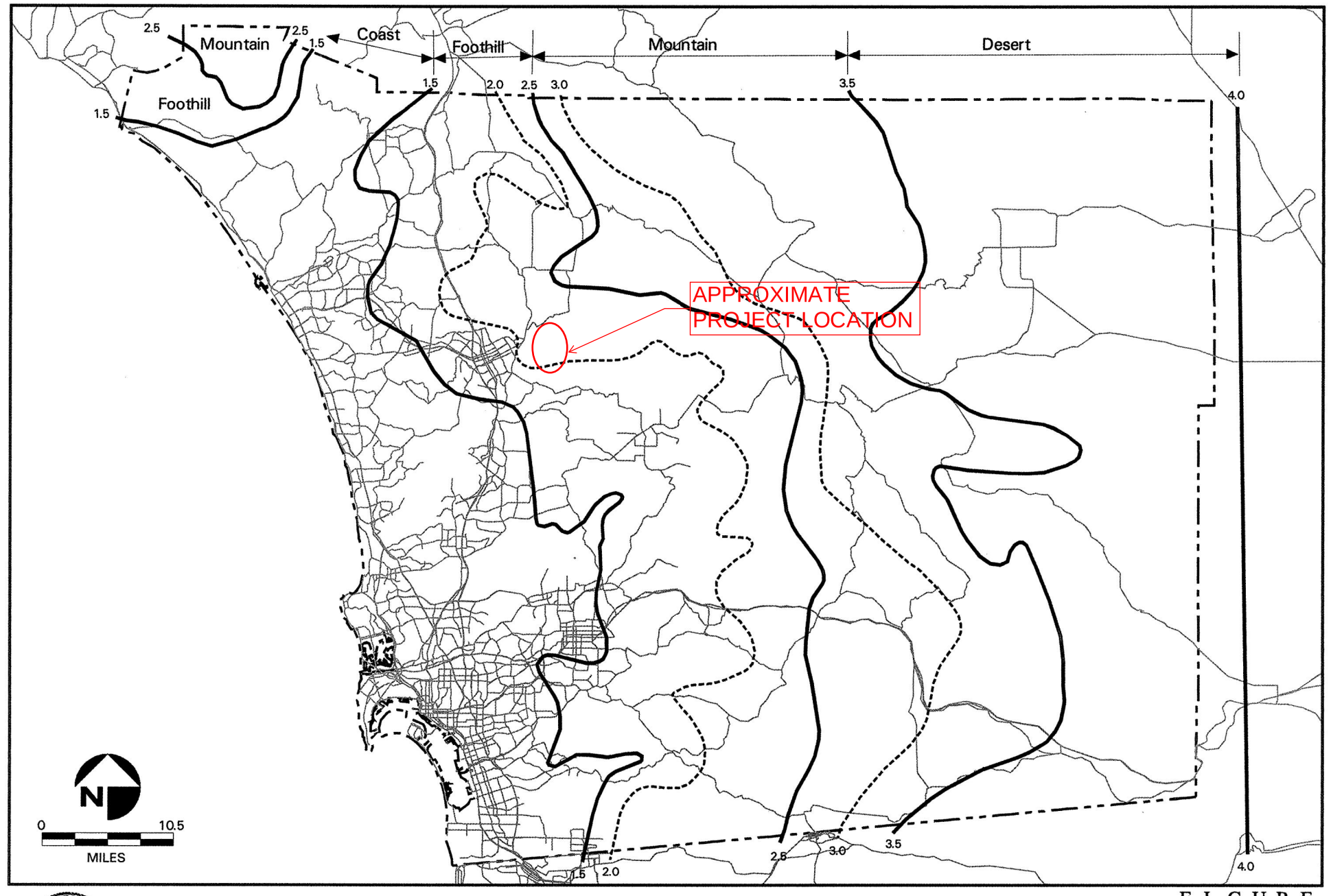
N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

FIGURE

C-1

Appendix 5 – Hydrologic Model & Exhibits - Existing Condition

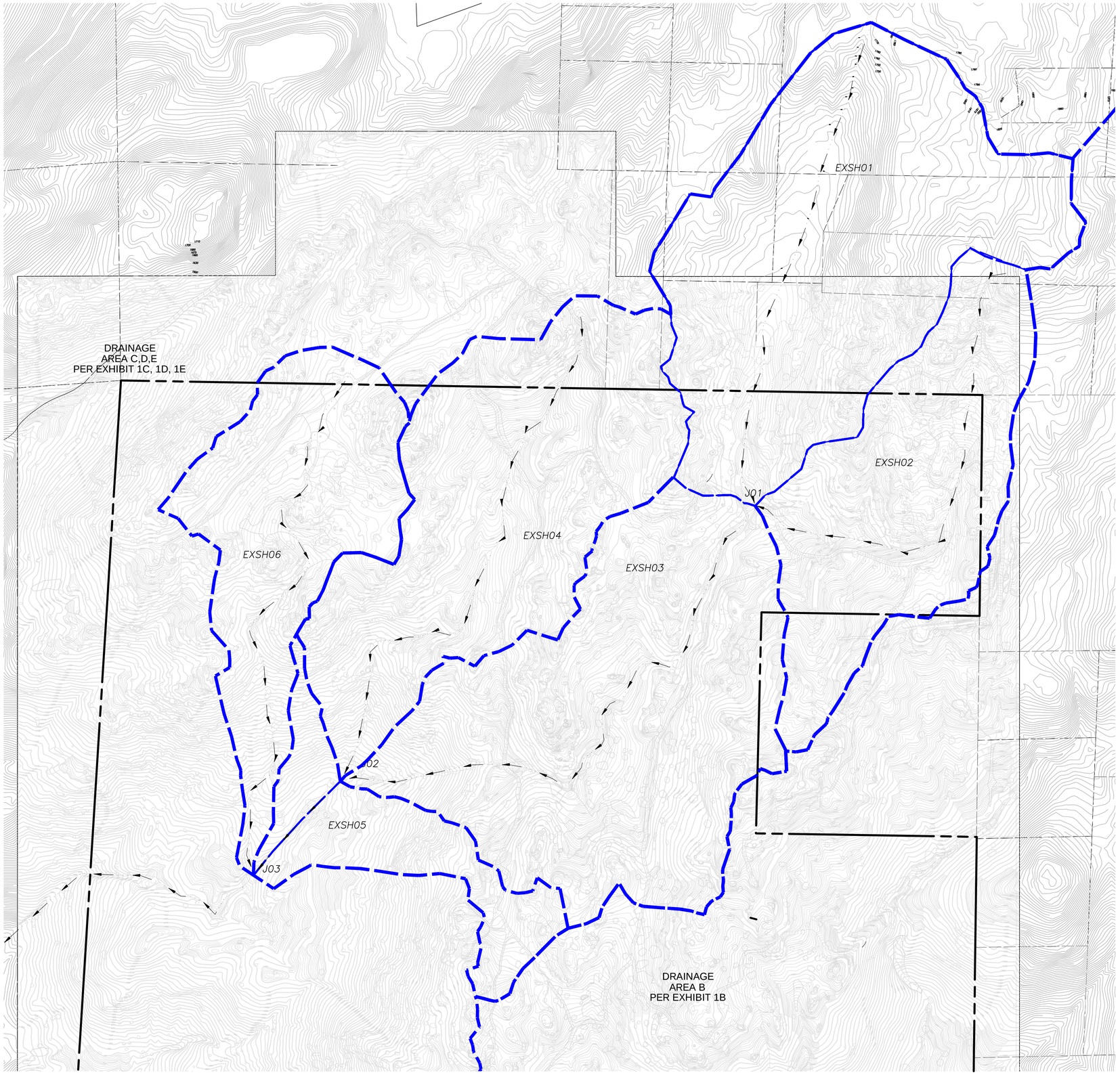
Drainage Area **A**

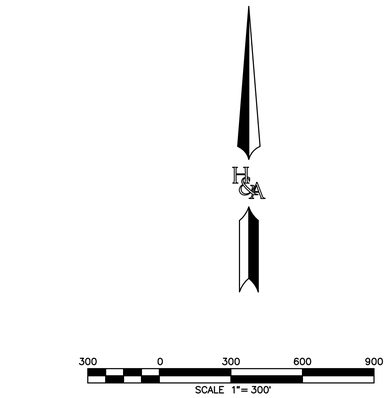
Drainage Area AHEC-HMS Routing Input-Existing Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
EXSH02	R1	J01	J02	3733	1602.0	1120.0	0.12912	681.74658	0.05	Trap	15' (W), 3H:1V
EXSH03	R2	J02	J03	778	860.0	820.0	0.05141	271.46530	0.05	Trap	20' (W), 8H:1V

HEC-HMS Basin Input-Existing Conditions Drainage Area A

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
EXSH01	4302980.0	0.154	0.050	3152	1355	0.597	0.257	1765.0	1602.0	163	273.046	0.20	0.17	9.98
EXSH02	2581237.0	0.093	0.050	3137	2040	0.594	0.386	2100.0	1602.0	498	838.202	0.19	0.16	9.37
EXSH03	4303730.0	0.154	0.050	3733	2107	0.707	0.399	1602.0	1120.0	482	681.747	0.21	0.18	10.61
EXSH04	3507524.0	0.126	0.050	3750	1656	0.710	0.314	1655.0	1120.0	535	753.280	0.19	0.16	9.46
EXSH05	1086799.0	0.039	0.050	778	404	0.147	0.077	1120.0	1046.0	74	502.211	0.07	0.05	2.96
EXSH06	2180584.0	0.078	0.050	3692	889	0.699	0.168	1630.0	1046.0	584	835.190	0.15	0.12	7.17
Total Check	17962854.0	0.644												





LEGEND

DRAINAGE WATERSHED BOUNDARY	
FLOW DIRECTION	
HYDROLOGIC NODE (HEC-HMS JUNCTION)	EXSH03

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

EXISTING CONDITION HYDROLOGY MAP FOR:

SAFARI HIGHLANDS RANCH

DRAINAGE AREA A

CITY OF ESCONDIDO, CA

EXHIBIT **1A**

W.O. 2374-17

R:\1211\&Hyd\ACAD\EXHIBIT 1A-Exist Condition.dwg[]Apr-21-2017:14:41

Drainage Area **B** (NRCS Hydrologic Model Method)

HEC-HMS Routing Input-Existing Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
EXSH02	R1	J01	J02	8015	1565.0	860.0	0.08796	464.42920	0.05	Trap	15' (W), 3H:1V
EXSH03	R2	J02	J03	2897	860.0	820.0	0.01381	72.90300	0.05	Trap	35' (W), 8H:1V
EXSH04	R3	J03	J04	2154	820.0	420.0	0.18570	980.50139	0.05	Trap	15' (W), 3H:1V
EXSH05	R4	J04	J05	543	420.0	414.0	0.01105	58.34254	0.05	Trap	20' (W), 3H:1V
EXSH06	R5	J05	J06	787	414.0	408.0	0.00762	40.25413	0.05	Trap	60' (W), 4H:1V
EXSH07	R6	J06	J07	234	408.0	406.0	0.00855	45.12821	0.018	Rect	30' (W)

HEC-HMS Basin Input-Existing Conditions

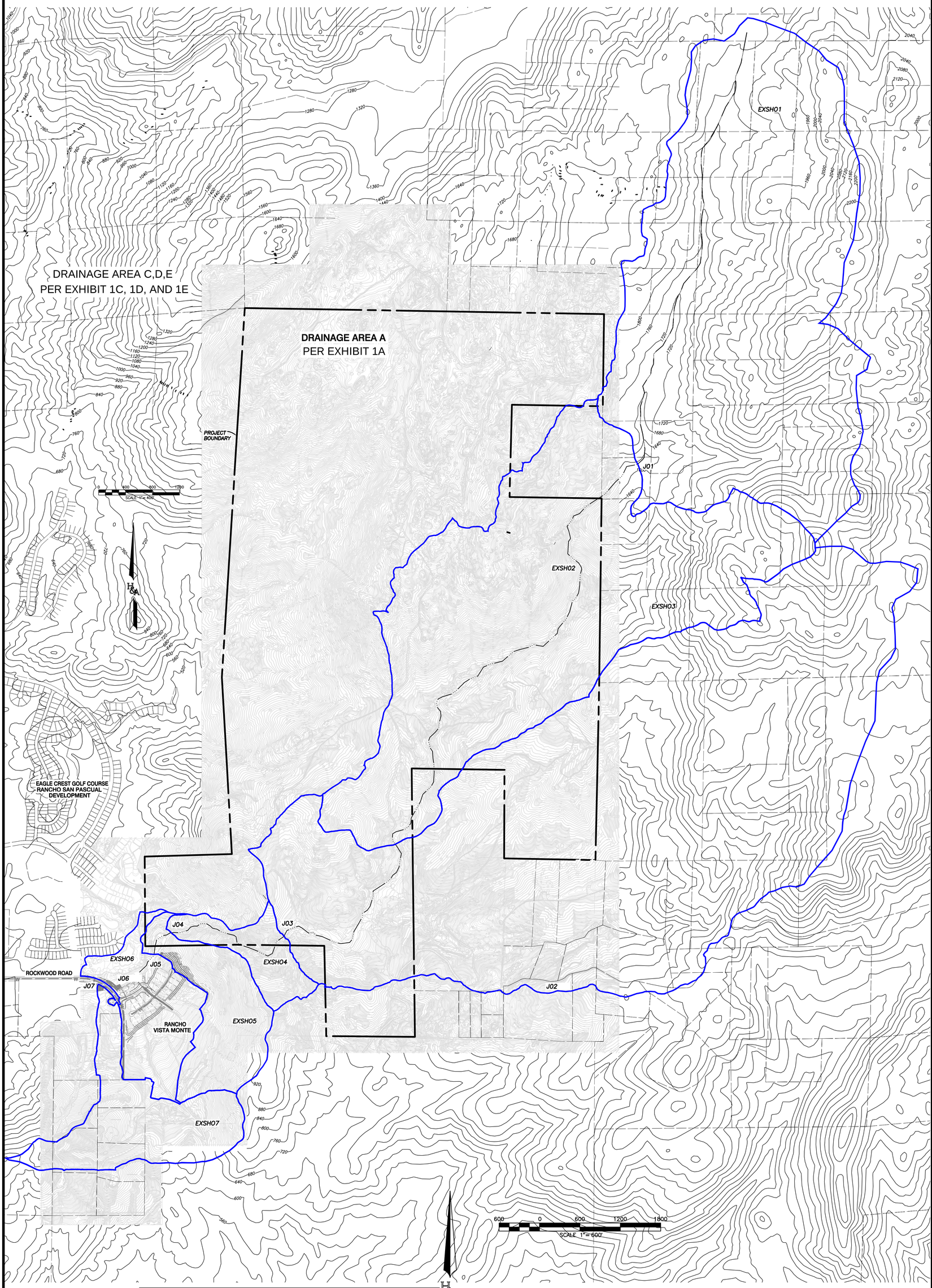
Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
EXSH01	21546035.7	0.773	0.050	7147	3139	1.354	0.595	1880.0	1565.0	315	232.713	0.39	0.33	19.79
EXSH02	19439649.1	0.697	0.050	9466	4572	1.793	0.866	2200.0	860.0	1340	747.433	0.40	0.34	20.37
EXSH03	34181823.2	1.226	0.050	14593	6473	2.764	1.226	1960.0	820.0	1140	412.472	0.61	0.52	30.93
EXSH04	1296883.5	0.047	0.050	2772	1589	0.525	0.301	1022.0	420.0	602	1146.667	0.16	0.13	7.57
EXSH05	2573064.6	0.092	0.050	3355	1228	0.635	0.233	921.0	414.0	507	797.902	0.16	0.13	7.93
EXSH06	2396067.7	0.086	0.018	2473	1099	0.468	0.208	560.0	413.0	147	313.854	0.06	0.04	2.59
EXSH07	3311088.3	0.119	0.050	5005	2578	0.948	0.488	1000.0	406.0	594	626.637	0.26	0.22	13.12
Total Check	81433523.9	3.040												

Drainage Area B

Project: EXHY Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Existing
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Yea
Compute Time: 16Sep2016, 09:38:43 Control Specifications: 24-Hour

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
EXSH01	0.773	1438.5	01Jan2014, 16:16	7.31
J01	0.773	1438.5	01Jan2014, 16:16	7.31
R1	0.773	1437.2	01Jan2014, 16:23	7.27
EXSH02	0.697	1275.3	01Jan2014, 16:17	7.31
J02	1.470	2654.4	01Jan2014, 16:20	7.29
R2	1.470	2643.3	01Jan2014, 16:25	7.26
EXSH03	1.226	1735.0	01Jan2014, 16:27	7.25
J03	2.696	4370.7	01Jan2014, 16:25	7.26
R3	2.696	4368.8	01Jan2014, 16:26	7.25
EXSH04	0.047	153.4	01Jan2014, 16:05	7.37
J04	2.743	4393.0	01Jan2014, 16:26	7.25
R4	2.743	4387.3	01Jan2014, 16:27	7.25
EXSH05	0.092	292.3	01Jan2014, 16:05	7.37
J05	2.835	4434.2	01Jan2014, 16:27	7.25
R5	2.835	4422.5	01Jan2014, 16:28	7.24
EXSH06	0.086	438.7	01Jan2014, 16:01	7.39
J06	2.921	4452.4	01Jan2014, 16:28	7.25
R6	2.921	4450.4	01Jan2014, 16:28	7.25
EXSH07	0.119	283.5	01Jan2014, 16:10	7.34
J07	3.040	4551.6	01Jan2014, 16:28	7.25



LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)

HYDROLOGIC NODE (HEC-HMS JUNCTION) J01

MAIN CHANNEL PATH

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING CONDITION HYDROLOGIC WORKMAP FOR:

SAFARI HIGHLANDS RANCH

DRAINAGE AREA B

CITY OF ESCONDIDO, CA

EXHIBIT **1B**

W.O. 2374-17

R:\12111\&Hyd\ACAD\EXIBIT 1B-Exist Condition.dwg[ ]Apr-21-2017:14:55

Drainage Area C, D, and E
- Offsite, Northeast, North, Northwest
(NRCS Hydrologic Model Method)

HEC-HMS Basin Input-Existing Conditions Drainage Area C (Offsite - Northwest)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
EX01	888217.0	0.032	0.050	1463	893	0.277	0.169	1577.0	1312.0	265	956.391	0.10	0.08	4.77
EX02	2420911.0	0.087	0.050	2149	1179	0.407	0.223	1312.0	842.0	470	1154.770	0.13	0.10	6.03
Total Check	3309128.0	0.119												

HEC-HMS Basin Input-Existing Conditions Drainage Area D (Offsite - north)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
EX01	52628830.0	1.888	0.050	11964	3967	2.266	0.751	2040.0	1350.0	690	304.514	0.50	0.42	25.13
EX02	11627753.0	0.417	0.050	6297	2921	1.193	0.553	1800.0	1340.0	460	385.707	0.33	0.28	16.59
EX03	20274336.0	0.727	0.050	3363	1689	0.637	0.320	1340.0	1300.0	40	62.801	0.30	0.25	14.94
EX04	4419569.0	0.159	0.050	2933	1192	0.555	0.226	1577.0	1300.0	277	498.657	0.17	0.14	8.16
EX05	32806681.0	1.177	0.050	11152	5437	2.112	1.030	1300.0	710.0	590	279.340	0.55	0.47	28.10
EX06	16732719.0	0.600	0.050	6055	2708	1.147	0.513	1800.0	710.0	1090	950.487	0.27	0.22	13.29
EX07	15791050.0	0.566	0.050	4399	1580	0.833	0.299	710.0	516.0	194	232.853	0.25	0.21	12.50
Total Check	154280938.0	5.534												

HEC-HMS Basin Input-Existing Conditions Drainage Area E (Offsite - Northeast)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PR01	827459.0	0.0297	0.050	1763	912	0.334	0.173	1480.0	860.0	620	1856.835	0.10	0.08	4.52
BASIN 8	18004.0	0.0006	0.050	549	274.5	0.104	0.052	879.0	860.0	19	182.732	0.06	0.04	2.67
PR02	877393.0	0.0315	0.050	1007	628	0.191	0.119	860.0	808.0	52	272.651	0.10	0.08	4.57
PR03	2796589.0	0.1003	0.050	3196	2014	0.605	0.381	1480.0	875.0	605	999.499	0.19	0.15	9.07
BASIN 7	10400.0	0.0004	0.050	135	67.5	0.026	0.013	879.0	875.0	4	156.444	0.02	0.01	0.63
PR04	114842.0	0.0041	0.050	693	201	0.131	0.038	870.0	808.0	62	472.381	0.05	0.03	2.07
PR06	544631.0	0.0195	0.050	1397	601	0.265	0.114	1240.0	870.0	370	1398.425	0.08	0.06	3.64
BASIN 6	11496.0	0.0004	0.050	193	96.5	0.037	0.018	879.0	876.0	3	82.073	0.03	0.02	1.17
PR05	669739.0	0.0240	0.050	711	355.5	0.135	0.067	808.0	760.0	48	356.456	0.07	0.05	2.90
PR08	140874.0	0.0051	0.050	654	522	0.124	0.099	1000.0	880.0	120	968.807	0.06	0.04	2.65
BASIN 5	23259.0	0.0008	0.050	489	244.5	0.093	0.046	884.0	875.0	9	97.178	0.06	0.05	2.78
PR09	74551.0	0.0027	0.050	412	130	0.078	0.025	878.0	750.0	128	1640.388	0.03	0.02	0.91
PR07	115689.0	0.0041	0.050	812	710	0.154	0.134	760.0	750.0	10	65.025	0.12	0.10	5.93
PR10	698133.0	0.0250	0.050	1038	338	0.197	0.064	750.0	690.0	60	305.202	0.08	0.06	3.47
PR11	1087863.0	0.0390	0.050	2770	1273	0.525	0.241	1240.0	890.0	350	667.148	0.16	0.13	7.72
BASIN 4	51609.0	0.0019	0.050	1515	705	0.287	0.134	918.0	884.0	34	118.495	0.14	0.11	6.75
PR12	498340.0	0.0179	0.050	801	287	0.152	0.054	880.0	690.0	190	1252.434	0.05	0.03	2.08
Total Check	8560871.0	0.3071												

Project: NE EX Simulation Run: 100-Year

Start of Run:	01Jan2014, 00:00	Basin Model:	Existing Conditions
End of Run:	02Jan2014, 00:00	Meteorologic Model:	100-Year Hyetograph
Compute Time:	13Apr2017, 14:26:23	Control Specifications:	24-Hour Event

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
EX02	0.087	319.3	01Jan2014, 16:04	7.38
EX01	0.032	131.3	01Jan2014, 16:02	7.38
J1	0.032	131.3	01Jan2014, 16:02	7.38
R1	0.032	130.1	01Jan2014, 16:05	7.37
J2	0.119	448.7	01Jan2014, 16:04	7.38

Project: N_Offsite_DirtRD_EX Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Existing C
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Year
Compute Time: 13Apr2017, 15:39:22 Control Specifications: 24-Hour I

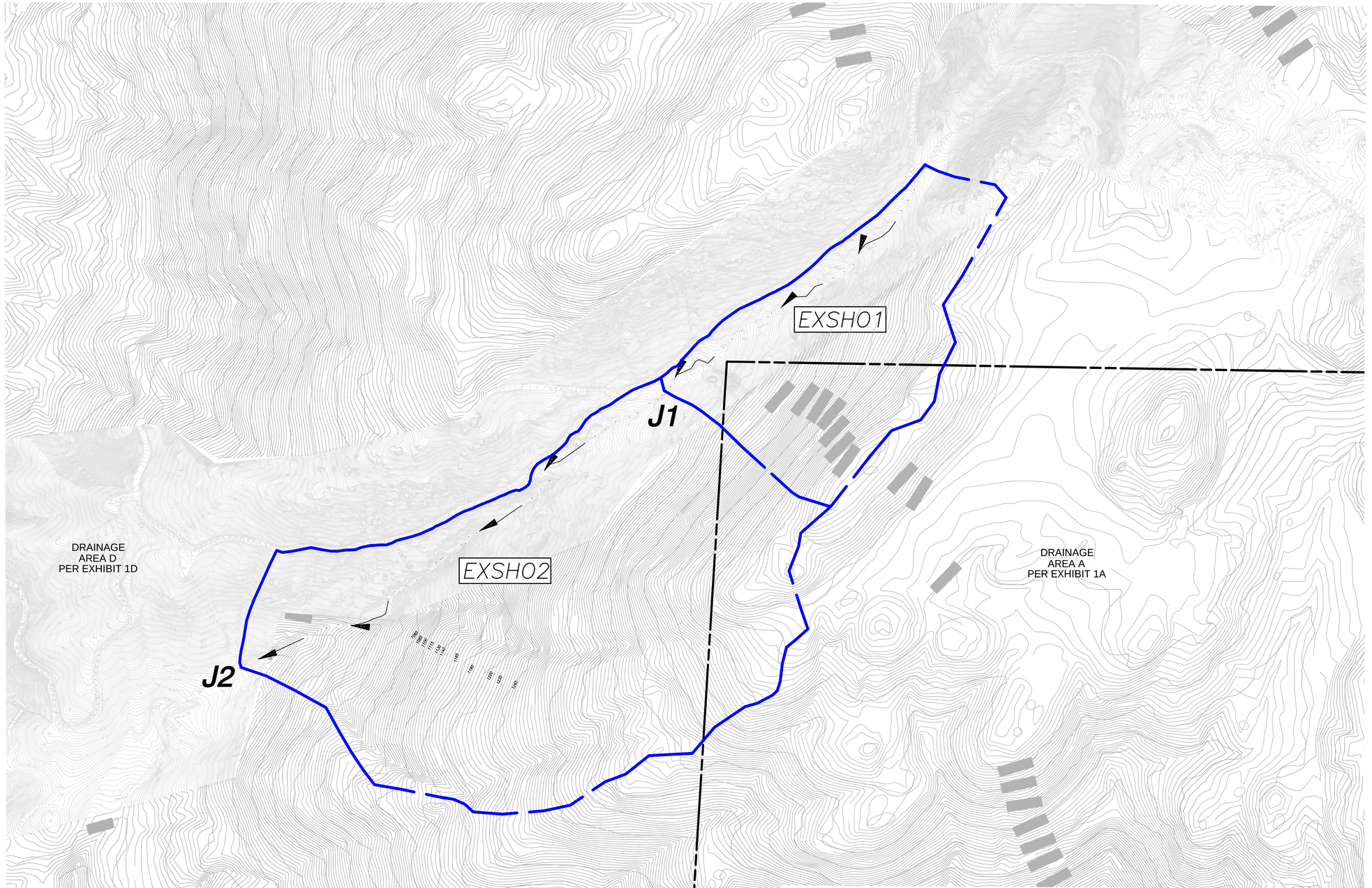
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
EX01	1.888	2931.0	01Jan2014, 16:22	6.57
EX02	0.417	832.9	01Jan2014, 16:13	6.61
J01	2.305	3641.5	01Jan2014, 16:19	6.58
R1	2.305	3623.8	01Jan2014, 16:23	6.55
EX03	0.727	1547.4	01Jan2014, 16:12	6.62
EX04	0.159	496.0	01Jan2014, 16:05	7.37
J02	3.191	4848.9	01Jan2014, 16:19	6.60
R2	3.191	4840.9	01Jan2014, 16:26	6.56
EX05	1.177	1706.2	01Jan2014, 16:24	6.55
EX06	0.600	1368.4	01Jan2014, 16:10	6.63
J03	4.968	7130.8	01Jan2014, 16:25	6.57
R3	4.968	7125.8	01Jan2014, 16:27	6.55
EX07	0.462	1132.1	01Jan2014, 16:09	6.64
BASIN 2	0.006	12.2	01Jan2014, 16:14	7.32
J04	5.436	7502.4	01Jan2014, 16:26	6.56
R4	5.436	7499.1	01Jan2014, 16:27	6.56
EX08	0.090	354.6	01Jan2014, 16:03	6.67
BASIN 3	0.008	32.6	01Jan2014, 16:03	7.38
J05	5.534	7536.7	01Jan2014, 16:27	6.56

Project: NW_ALT_Offsite_EX Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Existing C
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Year
Compute Time: 13Apr2017, 10:48:04 Control Specifications: 24-Hour I

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PRSH03	0.1000	268.7	01Jan2014, 16:06	6.65
PRSH06	0.0195	73.4	01Jan2014, 16:00	6.67
BASIN 7	0.0004	2.1	01Jan2014, 16:00	7.39
BASIN 6	0.0004	1.8	01Jan2014, 16:00	7.39
J06	0.1203	309.1	01Jan2014, 16:06	6.66
R5	0.1203	307.9	01Jan2014, 16:06	6.65
PRSH02	0.0315	118.1	01Jan2014, 16:03	7.38
PRSH01	0.0300	108.8	01Jan2014, 16:03	6.67
BASIN 8	0.0010	4.5	01Jan2014, 16:00	7.39
J01	0.0310	112.1	01Jan2014, 16:03	6.69
R1	0.0310	105.3	01Jan2014, 16:03	6.68
PRSH04	0.0041	19.7	01Jan2014, 16:00	6.67
J02	0.1869	506.2	01Jan2014, 16:03	6.78
R2	0.1869	497.6	01Jan2014, 16:06	6.77
PRSH05	0.0240	102.0	01Jan2014, 16:00	6.67
PRSH07	0.0040	13.3	01Jan2014, 16:03	6.66
J03	0.2149	566.4	01Jan2014, 16:03	6.76
R3	0.2149	557.3	01Jan2014, 16:06	6.75
PRSH08	0.0050	22.0	01Jan2014, 16:00	6.67
BASIN 5	0.0008	3.6	01Jan2014, 16:00	7.39
J07	0.0058	25.6	01Jan2014, 16:00	6.77
R6	0.0058	23.3	01Jan2014, 16:00	6.77
PRSH09	0.0027	13.9	01Jan2014, 16:00	6.67
J04	0.2234	571.9	01Jan2014, 16:06	6.75
R4	0.2234	555.0	01Jan2014, 16:06	6.74
PRSH11	0.0390	111.5	01Jan2014, 16:06	6.65

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
BASIN 4	0.0019	6.0	01Jan2014, 16:03	7.37
J08	0.0409	117.2	01Jan2014, 16:06	6.69
R7	0.0409	116.1	01Jan2014, 16:06	6.68
PRSH10	0.0250	96.9	01Jan2014, 16:00	6.67
PRSH12	0.0179	85.9	01Jan2014, 16:00	6.67
J05	0.3072	742.3	01Jan2014, 16:06	6.73



LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)

HYDROLOGIC NODE (HEC-HMS JUNCTION) J01

MAIN CHANNEL PATH

0 200 400 600

SCALE 1"= 200'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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ENGINEERING San Diego, Ca 92121
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EXISTING HYDROLOGY MAP FOR SAFARI HIGHLANDS RANCH DRAINAGE AREA C

CITY OF ESCONDIDO, CA

SHEET 1C

W.O. 2374-0017

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EXSH06

EXSH05

EXSH02

EXSH01

EXSH03

EXSH04

EXSH07

J1

J2

J3

J4

DRAINAGE
AREA E
PER EXHIBIT 1E

DRAINAGE
AREA C
PER EXHIBIT 1C

LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)

HYDROLOGIC NODE (HEC-HMS JUNCTION) J01

MAIN CHANNEL PATH

H&A

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC
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ENGINEERING San Diego, Ca 92121
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EXISTING HYDROLOGY MAP
FOR SAFARI HIGHLANDS RANCH
DRAINAGE AREA D

CITY OF ESCONDIDO, CA

SHEET 1D

W.O. 2374-0017

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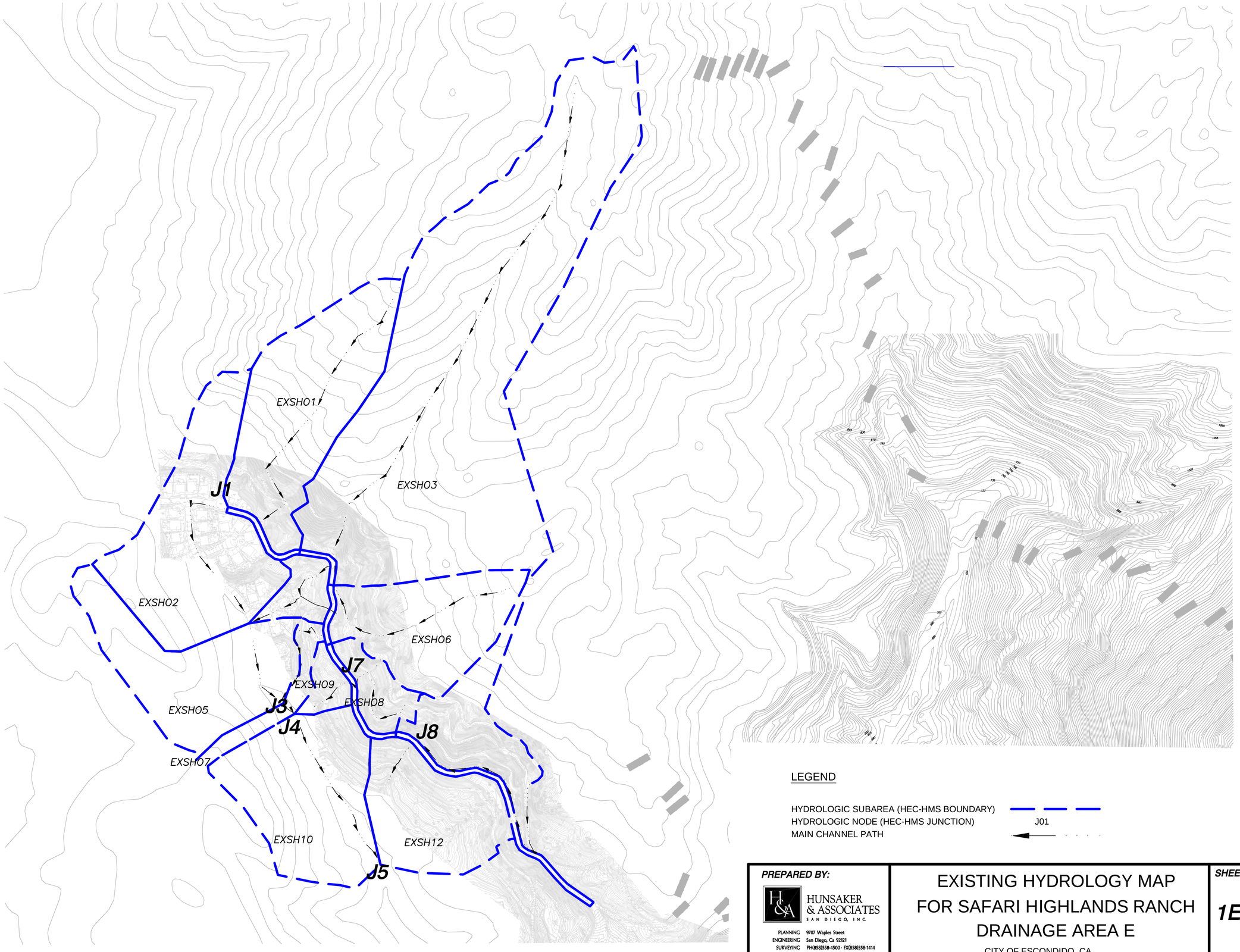

0 250 500 750
SCALE 1" = 250'

LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)
HYDROLOGIC NODE (HEC-HMS JUNCTION) J01
MAIN CHANNEL PATH

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC
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ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 - FX(858)558-1414

EXISTING HYDROLOGY MAP FOR SAFARI HIGHLANDS RANCH DRAINAGE AREA E

CITY OF ESCONDIDO, CA

SHEET 1E

W.O. 2374-0017

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Appendix 6 – Hydrologic Model & Exhibits - Proposed Condition

Drainage Area **A**

HEC-HMS Basin Input-Proposed Conditions Drainage Area A

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PRSH01	3930383.0	0.141	0.050	2546	1168	0.482	0.221	1765.0	1620.0	145	300.707	0.17	0.14	8.47
PRSH02	282095.0	0.010	0.050	1050	422	0.199	0.080	1620.0	1590.0	30	150.857	0.10	0.07	4.46
PRSH03	1319939.0	0.047	0.050	3137	1994	0.594	0.378	1900.0	1600.0	300	504.941	0.21	0.17	10.28
BASIN D	1012392.0	0.036	0.018	2963	1459	0.561	0.276	1671.0	1630.0	41	73.061	0.09	0.07	4.37
PRSH04	1517933.0	0.054	0.050	598	578	0.113	0.109	1590.0	1550.0	40	353.177	0.07	0.06	3.34
BASIN C	1042628.0	0.037	0.018	1230	1002	0.233	0.190	1625.0	1540.0	85	364.878	0.04	0.03	1.73
PRSH05	445416.0	0.016	0.050	1167	746	0.221	0.141	1550.0	1130.0	420	1900.257	0.08	0.06	3.46
BASIN F'	126427.0	0.005	0.018	1493	928	0.283	0.176	1791.0	1586.0	205	724.983	0.04	0.03	1.54
PRSH06	902514.0	0.032	0.050	1387	600	0.263	0.114	1492.0	1130.0	362	1378.053	0.08	0.06	3.64
BASIN B	1488357.0	0.053	0.018	3030	2107	0.574	0.399	1686.0	1507.0	179	311.921	0.08	0.06	3.79
PRSH07	1334477.0	0.048	0.050	1690	821	0.320	0.155	1650.0	1514.0	136	424.899	0.12	0.10	5.79
PRSH08	946687.0	0.034	0.050	1728	940	0.327	0.178	1514.0	1130.0	384	1173.333	0.11	0.08	5.00
PRSH09	563503.0	0.020	0.050	893	327	0.169	0.062	1130.0	1054.0	76	449.362	0.07	0.05	2.94
BASIN A	671887.0	0.024	0.018	1541	1267	0.292	0.240	1629.0	1585.0	44	150.759	0.06	0.04	2.64
PRSH10	563503.0	0.020	0.050	592	488	0.112	0.092	1630.0	1610.0	20	178.378	0.08	0.06	3.58
PRSH11	1065337.0	0.038	0.050	3084	1654	0.584	0.313	1610.0	1054.0	556	951.907	0.17	0.14	8.34
Total Check	2331493.1	0.579												

Drainage Area A HEC-HMS Routing Input-Proposed Conditions

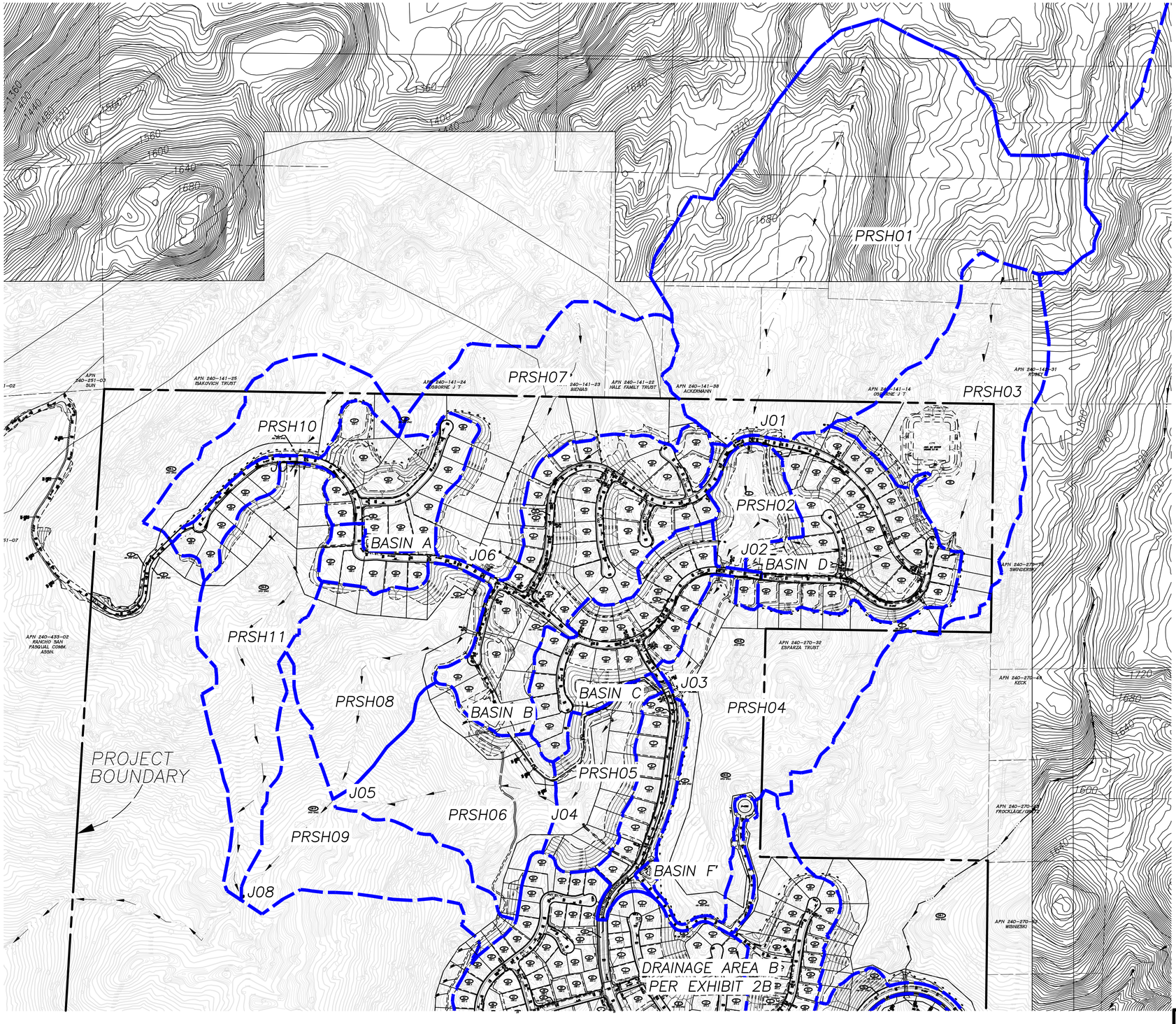
Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
PRSH02	R1	J01	J02	1050	1620.0	1590.0	0.02857	150.85714	0.05	Trap	15' (W), 3H:1V
PRSH04	R2	J02	J03	598	1590.0	1550.0	0.06689	353.17726	0.05	Trap	15' (W), 3H:1V
PRSH05	R3	J03	J04	1167	1550.0	1130.0	0.35990	1900.25707	0.05	Trap	15' (W), 3H:1V
PRSH06	R4	J04	J05	1387	1492.0	1130.0	0.26099	1378.05335	0.05	Trap	15' (W), 3H:1V
PRSH09	R5	J05	J08	893	1130.0	1054.0	0.08511	449.36170	0.05	Trap	15' (W), 3H:1V
PRSH07	R6	J06	J05	1690	1650.0	1514.0	0.08047	424.89941	0.05	Trap	15' (W), 3H:1V
PRSH10	R7	J07	J08	1638	1630.0	1610.0	0.01221	64.46886	0.05	Trap	15' (W), 3H:1V

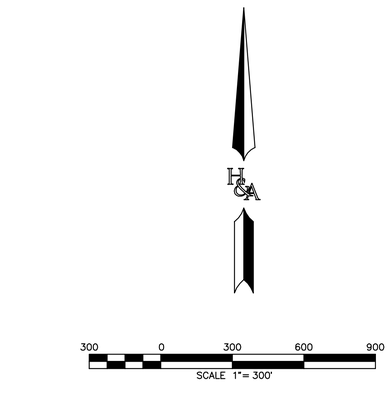
Project: PRHYA Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Propose
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Yea
Compute Time: 15Sep2016, 08:23:14 Control Specifications: 24-Hour

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PRSH01	0.141	431.9	01Jan2014, 16:06	7.37
J01	0.141	431.9	01Jan2014, 16:06	7.37
R1	0.141	429.0	01Jan2014, 16:07	7.36
PRSH03	0.047	128.9	01Jan2014, 16:07	7.36
BASIN D	0.035	151.5	01Jan2014, 16:02	7.50
DET D	0.035	33.9	01Jan2014, 16:12	5.68
PRSH02	0.010	42.7	01Jan2014, 16:02	7.38
J02	0.233	606.6	01Jan2014, 16:07	7.11
R2	0.233	605.8	01Jan2014, 16:08	7.10
PRSH04	0.054	257.4	01Jan2014, 16:01	7.39
J03	0.287	677.0	01Jan2014, 16:07	7.16
R3	0.287	675.8	01Jan2014, 16:08	7.15
BASIN C	0.037	206.8	01Jan2014, 16:00	7.51
DET C	0.037	110.1	01Jan2014, 16:02	6.07
PRSH05	0.016	75.1	01Jan2014, 16:01	7.39
BASIN F'	0.005	28.3	01Jan2014, 16:00	7.51
DET F'	0.005	25.0	01Jan2014, 16:01	6.76
J04	0.345	805.0	01Jan2014, 16:03	7.04
R4	0.345	804.0	01Jan2014, 16:04	7.04
BASIN B	0.053	240.7	01Jan2014, 16:02	7.51
DET B	0.053	138.3	01Jan2014, 16:05	6.30
PRSH07	0.049	183.9	01Jan2014, 16:03	7.38
J06	0.102	317.4	01Jan2014, 16:04	6.82
R6	0.102	315.4	01Jan2014, 16:06	6.81
PRSH08	0.034	137.3	01Jan2014, 16:03	7.38
PRSH06	0.032	146.7	01Jan2014, 16:01	7.39

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
J05	0.513	1323.4	01Jan2014, 16:04	7.04
R5	0.513	1319.1	01Jan2014, 16:05	7.03
PRSH11	0.038	117.3	01Jan2014, 16:06	7.37
BASIN A	0.024	119.8	01Jan2014, 16:01	7.51
DET A	0.024	84.2	01Jan2014, 16:03	7.07
PRSH10	0.020	92.5	01Jan2014, 16:01	7.39
J07	0.020	92.5	01Jan2014, 16:01	7.39
R7	0.020	87.1	01Jan2014, 16:07	7.35
J08	0.615	1624.3	01Jan2014, 16:05	7.08
PRSH09	0.020	99.5	01Jan2014, 16:01	7.39





LEGEND

DRAINAGE WATERSHED BOUNDARY	
FLOW DIRECTION	
HYDROLOGIC NODE (HEC-HMS JUNCTION)	J03

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PROPOSED CONDITION HYDROLOGY MAP FOR:

SAFARI HIGHLANDS RANCH

DRAINAGE AREA A

CITY OF ESCONDIDO, CA

EXHIBIT **2A**

W.O.

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Drainage Area **B**

HEC-HMS Basin Input-Proposed Conditions Drainage Area B

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PRSH01	21546035.7	0.773	0.050	7147	3139	1.354	0.595	1880.0	1565.0	315	232.713	0.39	0.33	19.79
PRSH02	2835992.7	0.102	0.050	2626	1400	0.497	0.265	1756.0	1440.0	316	635.369	0.16	0.13	7.93
PRSH03	5476632.9	0.196	0.050	3922	1254	0.743	0.238	2200.0	1308.0	892	1200.857	0.16	0.13	7.84
PRSH04	1017035.0	0.036	0.050	1836	870	0.348	0.165	1500.0	1207.5	292.5	841.176	0.11	0.09	5.32
BASIN F	436166.6	0.016	0.018	831	245	0.157	0.046	1678.5	1628.0	50.5	320.866	0.02	0.01	0.65
PRSH05	335324.8	0.012	0.050	1053	560	0.199	0.106	1528.0	1310.0	218	1093.105	0.07	0.05	3.29
PRSH06	1801807.0	0.065	0.050	2014	659	0.381	0.125	1573.6	1104.0	469.6	1231.126	0.10	0.08	4.55
BASIN E	1909527.8	0.068	0.018	2307	1069	0.437	0.202	1608.0	1525.0	83	189.961	0.06	0.05	2.78
PRSH07	1520143.8	0.055	0.050	2697	1515	0.511	0.287	1597.0	1070.0	527	1031.724	0.15	0.13	7.50
PRSH08	2652453.6	0.095	0.050	2555	1211	0.484	0.229	1278.5	856.5	422	872.078	0.14	0.12	6.94
PRSH09	379632.9	0.014	0.050	997	223	0.189	0.042	1129.0	980.0	149	789.087	0.05	0.04	2.29
BASIN G	2311700.0	0.083	0.018	6918	2080	1.310	0.394	1654.0	1060.0	594	453.356	0.11	0.08	4.94
BASIN H	850988.2	0.031	0.018	1788	803	0.339	0.152	1340.0	1244.0	96	283.490	0.05	0.03	1.98
PRSH10	27907181.5	1.001	0.050	13071	8034	2.476	1.522	1960.0	844.0	1116	450.806	0.62	0.53	31.67
PRSH11	831004.0	0.030	0.050	1540	638	0.292	0.121	880.0	800.0	80	274.286	0.12	0.09	5.49
BASIN I	4958959.0	0.178	0.018	6622	3022	1.254	0.572	1146.5	855.0	291.5	232.425	0.14	0.11	6.50
PRSH12	1224009.0	0.044	0.050	2772	1589	0.525	0.301	1022.0	420.0	602	1146.667	0.16	0.13	7.57
PRSH13	523341.5	0.019	0.050	963	396	0.182	0.075	1064.0	660.0	404	2215.078	0.05	0.04	2.31
PRSH14	2719784.7	0.098	0.050	3355	1228	0.635	0.233	921.0	414.0	507	797.902	0.16	0.13	7.93
BASIN J	401313.9	0.014	0.018	3763	2082	0.713	0.394	909.0	416.0	493	691.746	0.08	0.06	3.48
PRSH15	2331493.1	0.084	0.018	2473	1099	0.468	0.208	560.0	413.0	147	313.854	0.06	0.04	2.59
PRSH16	3311088.3	0.119	0.050	5005	2578	0.948	0.488	1000.0	406.0	594	626.637	0.26	0.22	13.12
Total Check	2331493.1	3.131												

Drainage Area B HEC-HMS Routing Input-Proposed Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
PRSH02	R1	J01	J02	1763	1565.0	1440.0	0.07090	374.36188	0.05	Trap	15' (W), 3H:1V
PRSH04	R2	J02	J03	1845	1440.0	1207.5	0.12602	665.36585	0.05	Trap	15' (W), 3H:1V
PRSH06	R3	J03	J04	1492	1207.5	1104.0	0.06937	366.27346	0.05	Trap	15' (W), 3H:1V
PRSH07	R4	J04	J05	1219	1104.0	1070.0	0.02789	147.26825	0.05	Trap	15' (W), 3H:1V
PRSH08	R5	J05	J06	1879	1070.0	856.5	0.11362	599.93614	0.05	Trap	15' (W), 3H:1V
PRSH10	R6	J06	J07	1217	856.5	844.0	0.01027	54.23172	0.05	Trap	35' (W), 8H:1V
PRSH11	R7	J07	J08	1638	844.0	800.0	0.02686	141.83150	0.05	Trap	35' (W), 8H:1V
PRSH12	R8	J08	J09	2009	800.0	420.0	0.18915	998.70582	0.05	Trap	15' (W), 3H:1V
PRSH14	R9	J09	J10	543	420.0	414.0	0.01105	58.34254	0.05	Trap	20' (W), 3H:1V
PRSH15	R10	J10	J11	787	414.0	408.0	0.00762	40.25413	0.05	Trap	60' (W), 4H:1V
PRSH16	R11	J11	J12	234	408.0	406.0	0.00855	45.12821	0.018	Rect	30' (W)

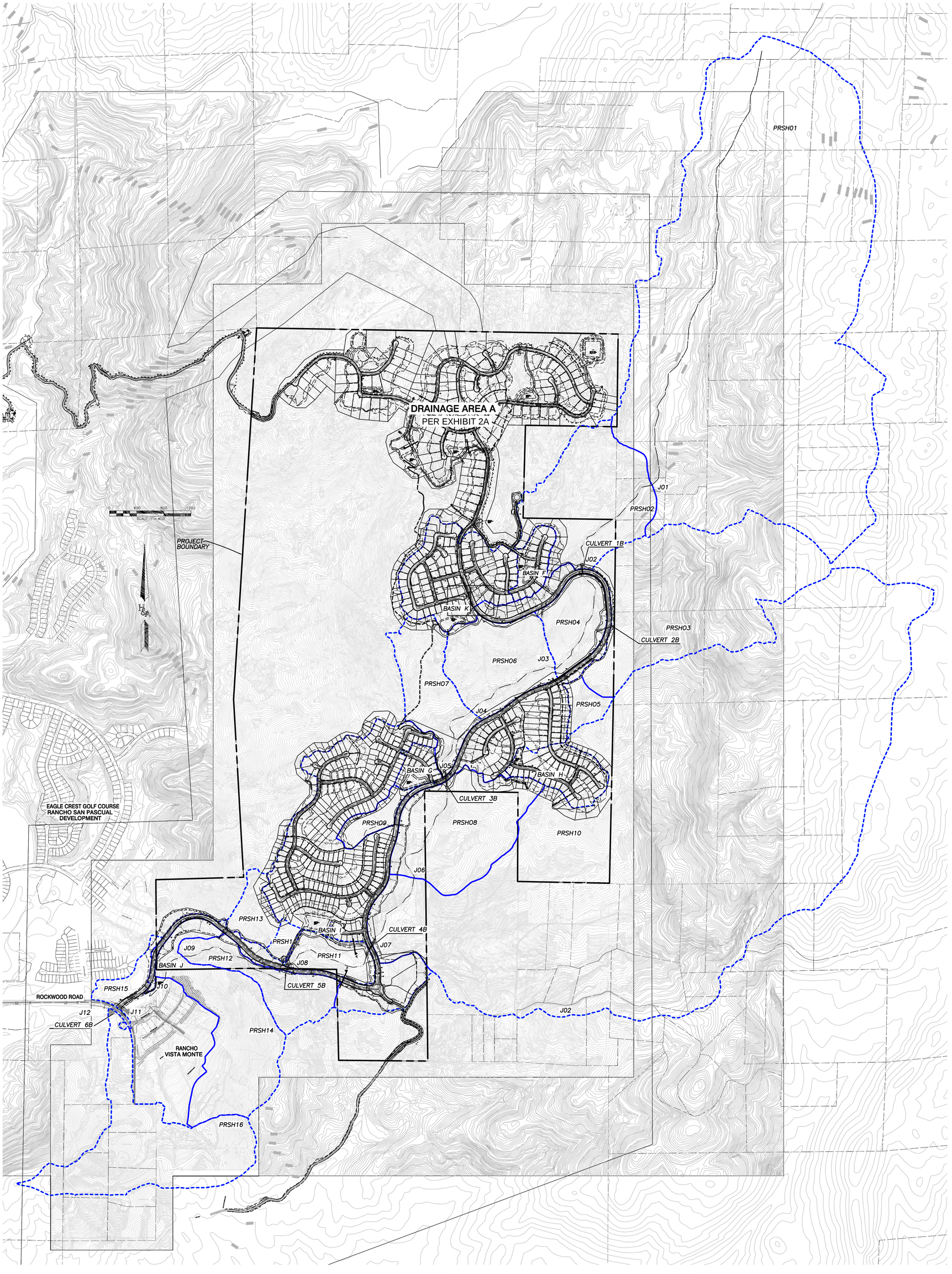
Project: PRHY Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00
End of Run: 02Jan2014, 00:00
Compute Time: 16Sep2016, 11:53:37

Basin Model: Propose
Meteorologic Model: 100-Yea
Control Specifications: 24-Hour

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
BASIN F	0.016	85.4	01Jan2014, 16:00	7.51
BASIN G	0.083	308.2	01Jan2014, 16:03	7.50
BASIN H	0.031	156.3	01Jan2014, 16:00	7.51
BASIN I	0.178	580.8	01Jan2014, 16:03	7.49
BASIN J	0.014	56.7	01Jan2014, 16:00	7.86
BASIN K	0.035	157.3	01Jan2014, 16:00	7.51
DET F	0.016	54.8	01Jan2014, 16:03	7.11
DET G	0.083	156.1	01Jan2014, 16:09	7.14
DET H	0.031	97.9	01Jan2014, 16:03	7.08
DET I	0.178	343.7	01Jan2014, 16:09	6.77
DET J	0.014	36.0	01Jan2014, 16:06	7.68
DET K	0.035	75.2	01Jan2014, 16:06	5.62
J01	0.773	1392.3	01Jan2014, 16:15	7.31
J02	0.875	1496.0	01Jan2014, 16:15	7.31
J03	1.135	1849.5	01Jan2014, 16:09	7.31
J04	1.235	2015.4	01Jan2014, 16:06	7.26
J05	1.290	2147.2	01Jan2014, 16:09	7.26
J06	1.513	2577.0	01Jan2014, 16:09	7.25
J07	2.514	3527.8	01Jan2014, 16:15	7.24
J08	2.722	3857.8	01Jan2014, 16:15	7.20
J09	2.785	3901.9	01Jan2014, 16:15	7.20
J10	2.883	4004.5	01Jan2014, 16:15	7.20
J11	2.981	4052.1	01Jan2014, 16:18	7.20
J12	3.100	4252.4	01Jan2014, 16:15	7.21
PRSH01	0.773	1392.3	01Jan2014, 16:15	7.31
PRSH02	0.102	299.5	01Jan2014, 16:06	7.37

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PRSH03	0.196	577.5	01Jan2014, 16:06	7.37
PRSH04	0.036	130.3	01Jan2014, 16:03	7.38
PRSH05	0.012	49.7	01Jan2014, 16:00	7.39
PRSH06	0.065	243.8	01Jan2014, 16:03	7.38
PRSH07	0.055	163.9	01Jan2014, 16:06	7.37
PRSH08	0.095	295.2	01Jan2014, 16:03	7.37
PRSH09	0.014	67.4	01Jan2014, 16:00	7.39
PRSH10	1.001	1371.8	01Jan2014, 16:27	7.25
PRSH11	0.030	107.3	01Jan2014, 16:03	7.38
PRSH12	0.044	130.9	01Jan2014, 16:06	7.37
PRSH13	0.019	91.2	01Jan2014, 16:00	7.39
PRSH14	0.098	287.7	01Jan2014, 16:06	7.37
PRSH15	0.084	386.5	01Jan2014, 16:00	7.39
PRSH16	0.119	270.2	01Jan2014, 16:09	7.34
R1	0.773	1389.3	01Jan2014, 16:18	7.30
R10	2.883	3996.9	01Jan2014, 16:18	7.19
R11	2.981	4050.8	01Jan2014, 16:18	7.20
R2	0.875	1495.1	01Jan2014, 16:18	7.30
R3	1.135	1843.9	01Jan2014, 16:09	7.31
R4	1.235	2014.8	01Jan2014, 16:09	7.25
R5	1.290	2129.5	01Jan2014, 16:09	7.25
R6	1.513	2541.3	01Jan2014, 16:12	7.24
R7	2.514	3522.5	01Jan2014, 16:18	7.23
R8	2.722	3838.1	01Jan2014, 16:18	7.20
R9	2.785	3891.9	01Jan2014, 16:18	7.20



LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)	
HYDROLOGIC NODE (HEC-HMS JUNCTION)	J01
MAIN CHANNEL PATH	

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PROPOSED CONDITION HYDROLOGIC WORKMAP FOR:

SAFARI HIGHLANDS RANCH

DRAINAGE AREA B

CITY OF ESCONDIDO, CA

EXHIBIT **2B**

W.O.

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Drainage Area C, D, E
(Northeast, North, Northwest)

HEC-HMS Basin Input-Proposed Conditions Drainage Area C (Offsite)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PR01	1412863.0	0.051	0.050	1383	893	0.262	0.169	1577.0	1321.0	256	977.354	0.10	0.08	4.63
BASIN 1	64183.0	0.002	0.050	2083	1040	0.395	0.197	1628.0	1321.0	307	778.185	0.13	0.10	6.14
PR02	1826132.0	0.066	0.050	2029	932	0.384	0.177	1321.0	842.0	479	1246.486	0.11	0.09	5.26
Total Check	3303178.0	0.118												

HEC-HMS Basin Input-Proposed Conditions Drainage Area D (Offsite - north)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PR01	52628830.0	1.888	0.050	11964	3967	2.266	0.751	2040.0	1350.0	690	304.514	0.50	0.42	25.13
PR02	11627753.0	0.417	0.050	6297	2921	1.193	0.553	1800.0	1340.0	460	385.707	0.33	0.28	16.59
PR03	20274336.0	0.727	0.050	3363	1689	0.637	0.320	1340.0	1300.0	40	62.801	0.30	0.25	14.94
PR04	4419569.0	0.159	0.050	2933	1192	0.555	0.226	1577.0	1300.0	277	498.657	0.17	0.14	8.16
PR05	32806681.0	1.177	0.050	11152	5437	2.112	1.030	1300.0	710.0	590	279.340	0.55	0.47	28.10
PR06	16732719.0	0.600	0.050	6055	2708	1.147	0.513	1800.0	710.0	1090	950.487	0.27	0.22	13.29
PR07	12891314.0	0.462	0.050	2831	1580	0.536	0.299	710.0	640.0	70	130.555	0.24	0.20	11.77
BASIN 2	162476.0	0.006	0.050	6796	3345	1.287	0.634	1330.0	670.0	660	512.772	0.34	0.28	17.05
BASIN 3	224290.0	0.008	0.050	7325	4125	1.387	0.781	670.0	516.0	154	111.006	0.51	0.43	25.65
PR08	2512970.0	0.090	0.050	1523	597	0.288	0.113	640.0	516.0	124	429.888	0.10	0.08	4.84
Total Check	154280938.0	5.534												

HEC-HMS Basin Input-Proposed Conditions Drainage Area E (Offsite - northeast)

Subarea	Area (ft^2)	Area (mi^2)	"n" value	L (ft)	L_c (ft)	L (miles)	L_c (miles)	$Elev_1$ (ft)	$Elev_2$ (ft)	$Elev_{(1-2)}$ (ft)	Slope (ft/mile)	Corps T_1 (hrs)	NRCS T_1 (hrs)	NRCS T_1 (min)
PR01	827459.0	0.0297	0.050	1763	912	0.334	0.173	1480.0	860.0	620	1856.835	0.10	0.08	4.52
BASIN 8	18004.0	0.0006	0.050	549	274.5	0.104	0.052	879.0	860.0	19	182.732	0.06	0.04	2.67
PR02	877393.0	0.0315	0.050	1007	628	0.191	0.119	860.0	808.0	52	272.651	0.10	0.08	4.57
PR03	2796589.0	0.1003	0.050	3196	2014	0.605	0.381	1480.0	875.0	605	999.499	0.19	0.15	9.07
BASIN 7	10400.0	0.0004	0.050	135	67.5	0.026	0.013	879.0	875.0	4	156.444	0.02	0.01	0.63
PR04	114842.0	0.0041	0.050	693	201	0.131	0.038	870.0	808.0	62	472.381	0.05	0.03	2.07
PR06	544631.0	0.0195	0.050	1397	601	0.265	0.114	1240.0	870.0	370	1398.425	0.08	0.06	3.64
BASIN 6	11496.0	0.0004	0.050	193	96.5	0.037	0.018	879.0	876.0	3	82.073	0.03	0.02	1.17
PR05	669739.0	0.0240	0.050	711	355.5	0.135	0.067	808.0	760.0	48	356.456	0.07	0.05	2.90
PR08	140874.0	0.0051	0.050	654	522	0.124	0.099	1000.0	880.0	120	968.807	0.06	0.04	2.65
BASIN 5	23259.0	0.0008	0.050	489	244.5	0.093	0.046	884.0	875.0	9	97.178	0.06	0.05	2.78
PR09	74551.0	0.0027	0.050	412	130	0.078	0.025	878.0	750.0	128	1640.388	0.03	0.02	0.91
PR07	115689.0	0.0041	0.050	812	710	0.154	0.134	760.0	750.0	10	65.025	0.12	0.10	5.93
PR10	698133.0	0.0250	0.050	1038	338	0.197	0.064	750.0	690.0	60	305.202	0.08	0.06	3.47
PR11	1087863.0	0.0390	0.050	2770	1273	0.525	0.241	1240.0	890.0	350	667.148	0.16	0.13	7.72
BASIN 4	51609.0	0.0019	0.050	1515	705	0.287	0.134	918.0	884.0	34	118.495	0.14	0.11	6.75
PR12	498340.0	0.0179	0.050	801	287	0.152	0.054	880.0	690.0	190	1252.434	0.05	0.03	2.08
Total Check	8560871.0	0.3071												

Drainage Area C HEC-HMS Routing Input-Proposed Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
PRSH03	R1	J01	J02	3363	1340.0	1300.0	0.01189	62.80107	0.05	Trap	15' (W), 3H:1V
PRSH05	R2	J02	J03	11152	1300.0	710.0	0.05291	279.34003	0.05	Trap	15' (W), 3H:1V
PRSH07	R3	J03	J04	2831	710.0	640.0	0.02473	130.55457	0.05	Trap	15' (W), 3H:1V
PRSH08	R4	J04	J05	1523	640.0	516.0	0.08142	429.88838	0.05	Trap	15' (W), 3H:1V

Drainage Area D HEC-HMS Routing Input-Proposed Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
PRSH02	R1	J01	J02	2029	1321.0	842.0	0.23608	1246.48595	0.05	Trap	15' (W), 3H:1V

Drainage Area E HEC-HMS Routing Input-Proposed Conditions

Subarea	Reach	U/S Node	D/S Node	Length (ft)	U/S Elev (ft)	D/S Elev (ft)	Slope (ft/ft)	Slope (ft/mi)	"n" value	Channel Type	Dimensions
PRSH02	R1	J01	J02	1007	860.0	808.0	0.05164	272.65144	0.05	Trap	15' (W), 3H:1V
PRSH05	R2	J02	J03	711	808.0	760.0	0.06751	356.45570	1.05	Trap	15' (W), 3H:1V
PRSH07	R3	J03	J04	812	760.0	750.0	0.01232	65.02463	0.05	Trap	15' (W), 3H:1V
PRSH010	R4	J04	J05	1038	750.0	690.0	0.05780	305.20231	0.05	Trap	15' (W), 3H:1V
PRSH04	R5	J06	J02	693	870.0	808.0	0.08947	472.38095	1.05	Trap	15' (W), 3H:1V
PRSH09	R6	J07	J04	412	878.0	750.0	0.31068	1640.38835	2.05	Trap	15' (W), 3H:1V
PRSH012	R7	J08	J05	801	880.0	690.0	0.23720	1252.43446	3.05	Trap	15' (W), 3H:1V

Project: NE_Offsite_RD_PR Simulation Run: 100-Year

Start of Run:	01Jan2014, 00:00	Basin Model:	Proposed
End of Run:	02Jan2014, 00:00	Meteorologic Model:	100-Year
Compute Time:	14Apr2017, 08:36:01	Control Specifications:	24-Hour I

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PR02	0.066	261.0	01Jan2014, 16:03	7.38
PR01	0.051	196.0	01Jan2014, 16:03	7.38
BASIN 1	0.002	7.3	01Jan2014, 16:04	7.50
DET 1	0.002	6.6	01Jan2014, 16:06	6.34
J01	0.053	201.6	01Jan2014, 16:03	7.34
R1	0.053	200.6	01Jan2014, 16:05	7.33
J02	0.119	442.4	01Jan2014, 16:04	7.36

Project: N_Offsite_Rd_PR Simulation Run: 100-Year

Start of Run:	01Jan2014, 00:00	Basin Model:	Proposed
End of Run:	02Jan2014, 00:00	Meteorologic Model:	100-Year
Compute Time:	13Apr2017, 15:41:25	Control Specifications:	24-Hour I

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PR01	1.888	2931.0	01Jan2014, 16:22	6.57
PR02	0.417	832.9	01Jan2014, 16:13	6.61
J01	2.305	3641.5	01Jan2014, 16:19	6.58
R1	2.305	3623.8	01Jan2014, 16:23	6.55
PR03	0.727	1547.4	01Jan2014, 16:12	6.62
PR04	0.159	478.9	01Jan2014, 16:05	6.65
J02	3.191	4844.4	01Jan2014, 16:19	6.57
R2	3.191	4836.1	01Jan2014, 16:27	6.53
PR05	1.177	1706.2	01Jan2014, 16:24	6.55
PR06	0.600	1368.4	01Jan2014, 16:10	6.63
J03	4.968	7124.8	01Jan2014, 16:25	6.54
R3	4.968	7119.6	01Jan2014, 16:27	6.53
PR07	0.462	1132.1	01Jan2014, 16:09	6.64
BASIN 2	0.006	12.3	01Jan2014, 16:14	7.44
DET 2	0.006	11.3	01Jan2014, 16:19	6.58
J04	5.436	7497.6	01Jan2014, 16:26	6.54
R4	5.436	7494.4	01Jan2014, 16:27	6.54
PRSH08	0.090	354.6	01Jan2014, 16:03	6.67
BASIN 3	0.008	32.7	01Jan2014, 16:03	7.50
DET 3	0.008	27.3	01Jan2014, 16:05	6.85
J05	5.534	7533.3	01Jan2014, 16:27	6.54

Project: North Offsite Road PR - 10yr Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Proposed
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Year
Compute Time: 23Apr2017, 16:35:05 Control Specifications: 24-Hour I

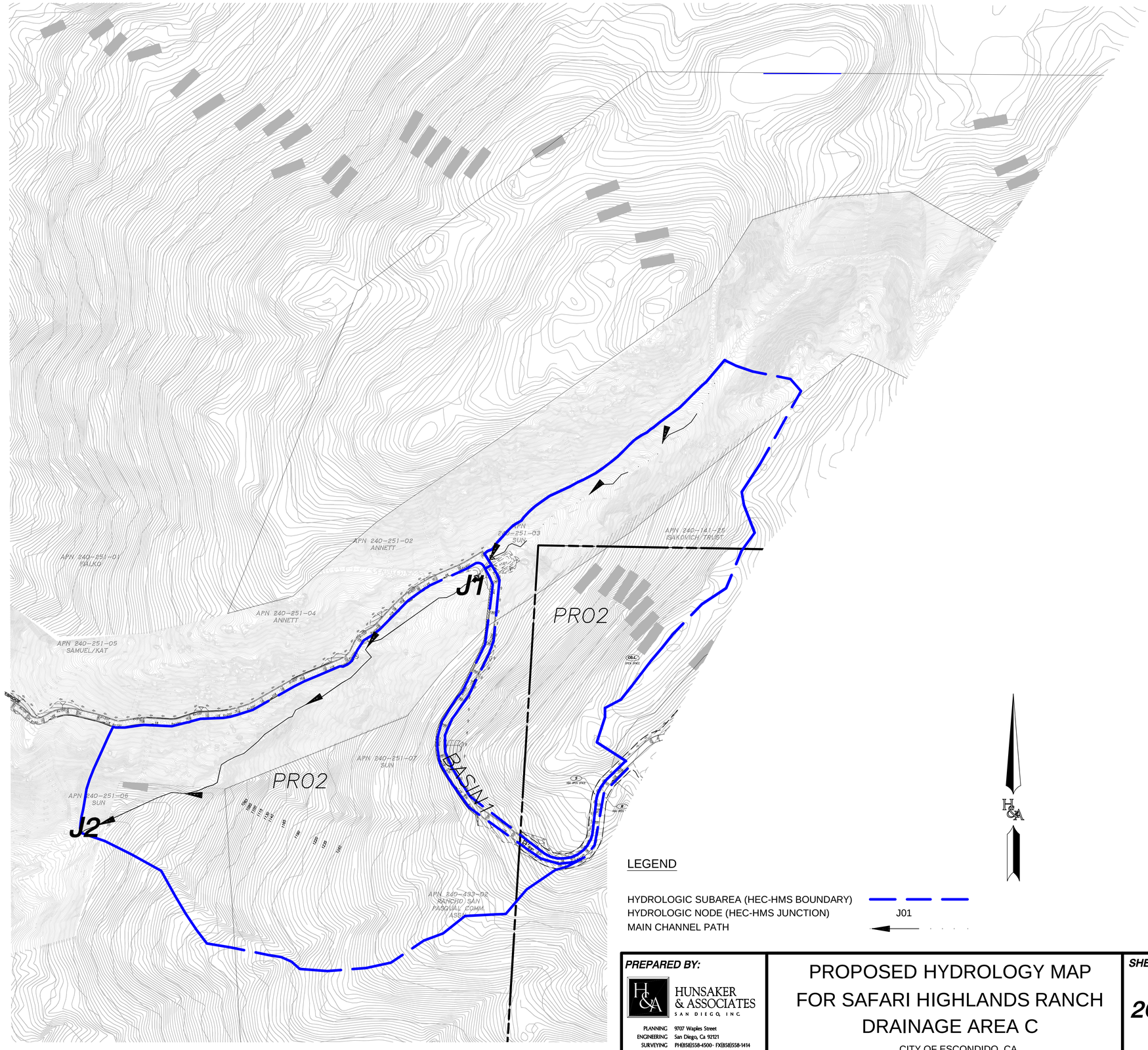
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PR01	1.888	1700.8	01Jan2014, 16:22	3.88
PR02	0.417	478.4	01Jan2014, 16:14	3.90
J01	2.305	2109.9	01Jan2014, 16:19	3.89
R1	2.305	2100.5	01Jan2014, 16:24	3.87
PR03	0.727	887.5	01Jan2014, 16:12	3.91
PR04	0.159	273.4	01Jan2014, 16:05	3.93
J02	3.191	2783.7	01Jan2014, 16:20	3.88
R2	3.191	2780.7	01Jan2014, 16:28	3.85
PR05	1.177	992.9	01Jan2014, 16:25	3.87
PR06	0.600	783.6	01Jan2014, 16:10	3.91
J03	4.968	4083.8	01Jan2014, 16:26	3.87
R3	4.968	4081.0	01Jan2014, 16:29	3.86
PR07	0.462	647.7	01Jan2014, 16:09	3.92
BASIN 2	0.006	7.3	01Jan2014, 16:14	4.66
DET 2	0.006	6.8	01Jan2014, 16:19	3.81
J04	5.436	4286.7	01Jan2014, 16:28	3.86
R4	5.436	4285.5	01Jan2014, 16:29	3.86
PRSH08	0.090	202.3	01Jan2014, 16:03	3.94
BASIN 3	0.008	19.4	01Jan2014, 16:03	4.70
DET 3	0.008	15.2	01Jan2014, 16:05	4.05
J05	5.534	4309.3	01Jan2014, 16:29	3.86

Project: NW_Offsite_RD_PR Simulation Run: 100-Year

Start of Run: 01Jan2014, 00:00 Basin Model: Proposed
End of Run: 02Jan2014, 00:00 Meteorologic Model: 100-Year
Compute Time: 13Apr2017, 10:28:06 Control Specifications: 24-Hour I

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PRSH03	0.1000	268.7	01Jan2014, 16:06	6.65
PRSH06	0.0195	73.4	01Jan2014, 16:00	6.67
BASIN 6	0.0004	1.8	01Jan2014, 16:00	7.87
DET 6	0.0004	1.8	01Jan2014, 16:00	7.70
BASIN 7	0.0004	2.1	01Jan2014, 16:00	7.87
DET 7	0.0004	2.2	01Jan2014, 16:00	7.70
J06	0.1203	309.2	01Jan2014, 16:06	6.66
R5	0.1203	308.3	01Jan2014, 16:06	6.65
PRSH02	0.0315	118.1	01Jan2014, 16:03	7.38
PRSH01	0.0300	108.8	01Jan2014, 16:03	6.67
BASIN 8	0.0010	4.6	01Jan2014, 16:00	7.87
DET 8	0.0010	4.5	01Jan2014, 16:00	7.78
J01	0.0310	112.4	01Jan2014, 16:03	6.70
R1	0.0310	105.2	01Jan2014, 16:03	6.69
PRSH04	0.0041	19.7	01Jan2014, 16:00	6.67
J02	0.1869	506.4	01Jan2014, 16:03	6.78
R2	0.1869	498.4	01Jan2014, 16:06	6.78
PRSH05	0.0240	102.0	01Jan2014, 16:00	6.67
PRSH07	0.0040	13.3	01Jan2014, 16:03	6.66
J03	0.2149	566.4	01Jan2014, 16:03	6.76
R3	0.2149	557.7	01Jan2014, 16:06	6.75
PRSH08	0.0050	22.0	01Jan2014, 16:00	6.67
BASIN 5	0.0008	3.6	01Jan2014, 16:00	7.87
DET 5	0.0008	3.4	01Jan2014, 16:00	7.70
J07	0.0058	25.4	01Jan2014, 16:00	6.81
R6	0.0058	23.1	01Jan2014, 16:00	6.82

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
PRSH09	0.0027	13.9	01Jan2014, 16:00	6.67
J04	0.2234	572.5	01Jan2014, 16:06	6.75
R4	0.2234	555.2	01Jan2014, 16:06	6.75
PRSH11	0.0390	111.5	01Jan2014, 16:06	6.65
BASIN 4	0.0019	6.1	01Jan2014, 16:03	7.85
DET 4	0.0019	5.5	01Jan2014, 16:06	7.32
J08	0.0409	116.9	01Jan2014, 16:06	6.68
R7	0.0409	115.5	01Jan2014, 16:06	6.68
PRSH10	0.0250	96.9	01Jan2014, 16:00	6.67
PRSH12	0.0179	85.9	01Jan2014, 16:00	6.67
J05	0.3072	742.0	01Jan2014, 16:06	6.73



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HUNSAKER & ASSOCIATES
SAN DIEGO, INC

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PROPOSED HYDROLOGY MAP FOR SAFARI HIGHLANDS RANCH DRAINAGE AREA C

CITY OF ESCONDIDO, CA

SHEET

2C

W.O. 2374-0017

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PR06

PR05

PR02

PR01

PR03

PR04

PR07

PR08

J1

J2

J3

J4

J5

J6

J2

BASIN 2

BASIN 3

LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)

HYDROLOGIC NODE (HEC-HMS JUNCTION) J01

MAIN CHANNEL PATH

H&A

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PROPOSED HYDROLOGY MAP FOR SAFARI HIGHLANDS RANCH DRAINAGE AREA D

CITY OF ESCONDIDO, CA

SHEET

2D

W.O. 2374-0017

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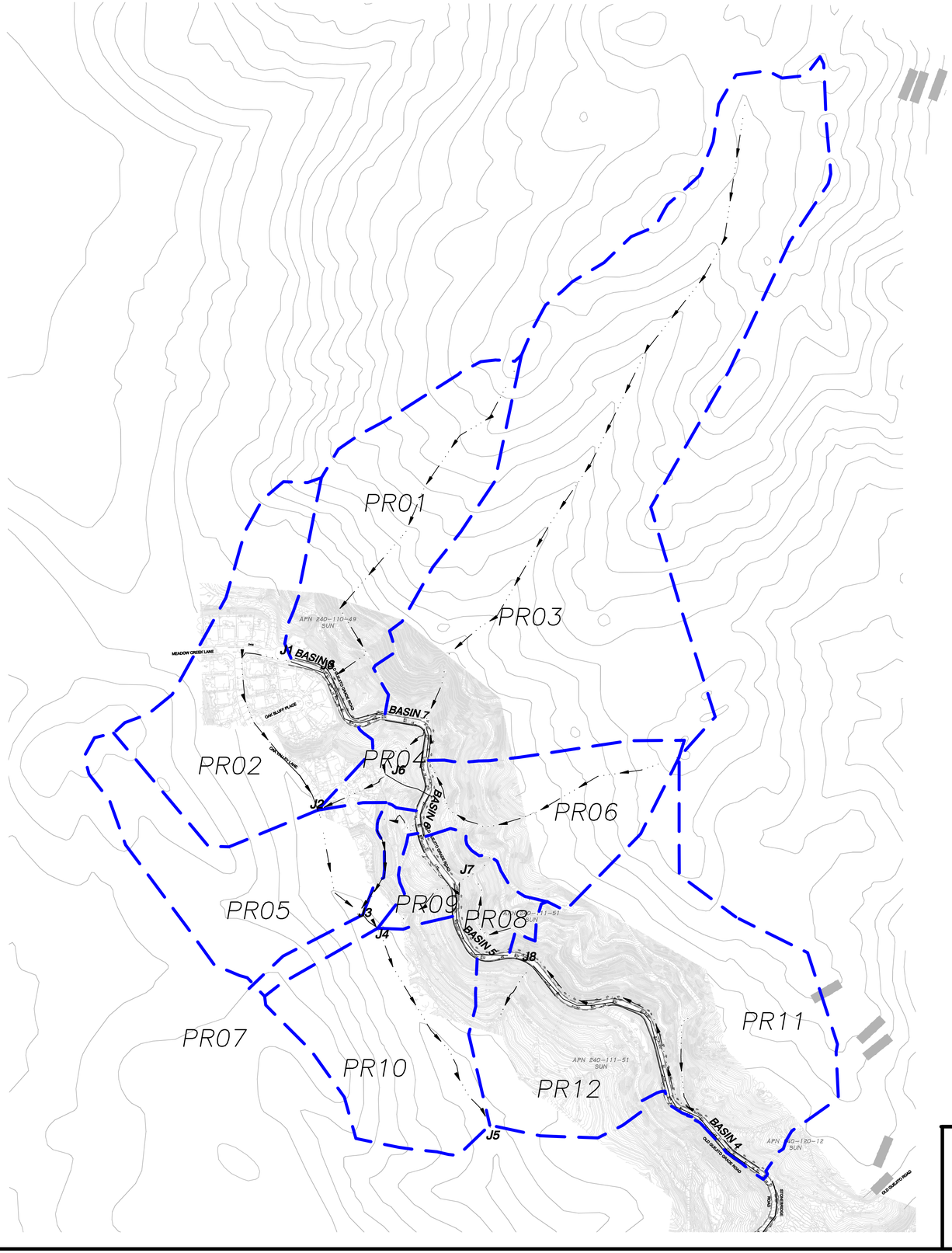

0 250 500 750
SCALE 1" = 250'

LEGEND

HYDROLOGIC SUBAREA (HEC-HMS BOUNDARY)
HYDROLOGIC NODE (HEC-HMS JUNCTION) J01
MAIN CHANNEL PATH

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PROPOSED HYDROLOGY MAP FOR SAFARI HIGHLANDS RANCH DRAINAGE AREA E

CITY OF ESCONDIDO, CA

SHEET 2E

W.O. 2374-0017

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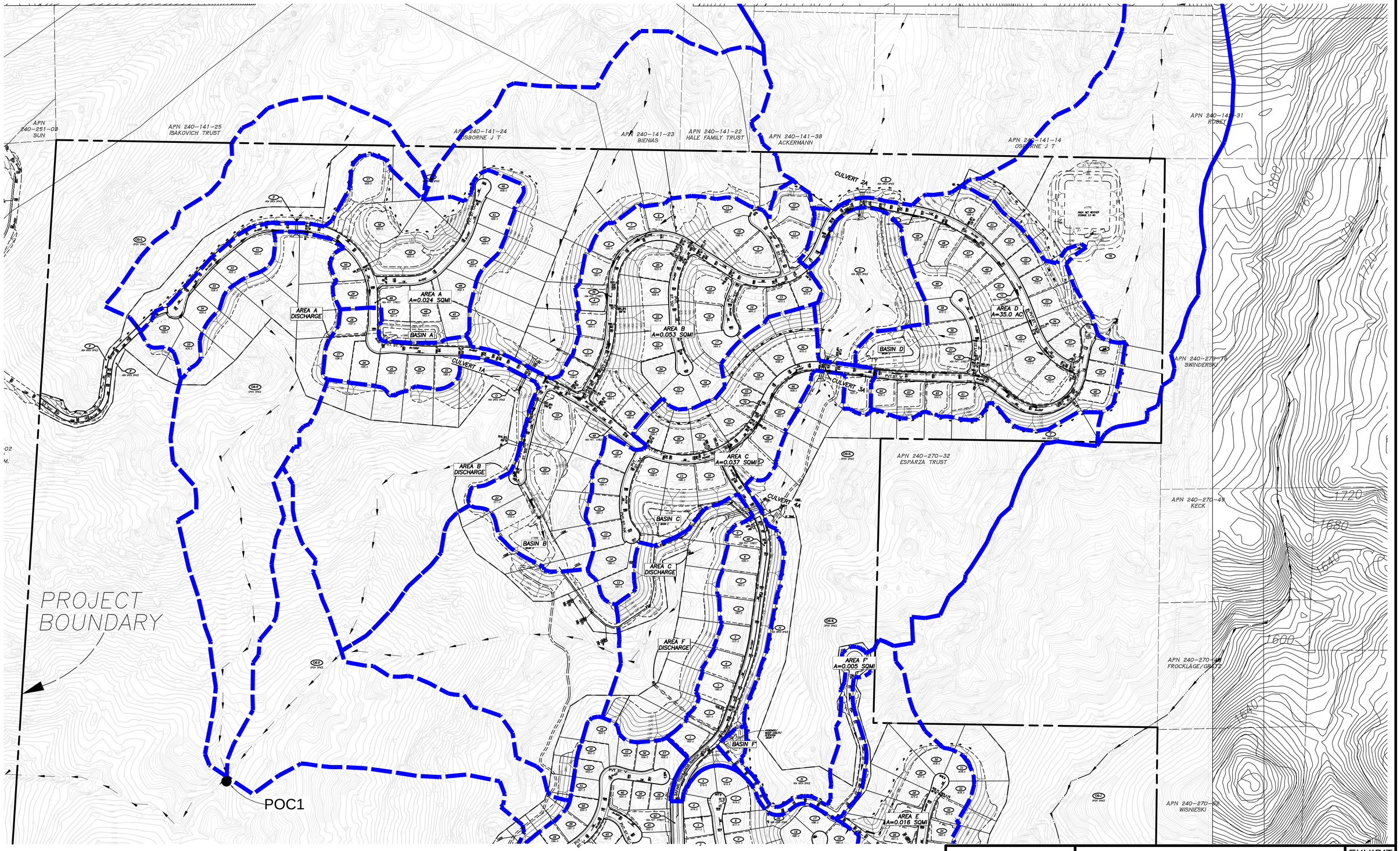
Appendix 7 – Onsite Hydrology Exhibit



SEE SHEET 5B

LEGEND

DRAINAGE WATERSHED BOUNDARY

FLOW DIRECTION

0 200 400 600

SCALE 1" =200'

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ONSITE PROPOSED CONDITION HYDROLOGY

SAFARI HIGHLANDS RANCH

DRAINAGE AREA A

CITY OF ESCONDIDO, CA

EXHIBIT **3A**

W.O.

R:\1211\&Hyd\ACAD\EXIBIT 3A-Proposed Condition.dwg[]Sep-12-2016:16:54

SEE SHEET 5A

AREA F DISCHARGE

AREA F A=0.005 SQMI

BASIN F

HYDROMOD/ WATER QUALITY/ DETENTION BASIN 'F'

SAFARI HIGHLANDS RANCH ROAD

AREA F A=0.016 SQMI

AREA K A=0.035 SQMI

BASIN K

AREA K DISCHARGE

AREA F DISCHARGE

AREA G A=0.083 SQMI

BASIN G

AREA H A=0.031 SQMI

BASIN H

AREA H DISCHARGE

AREA F DISCHARGE

APN 240-270-
FROCKLAGE/GRA

APN 240-270-
WISNIESKI

APN
APN 240-270-01
YALOF

APN 242-010-35
MCINDOE

APN 242-010-35
MCINDOE

APN 242-020-33
LUGO/GARCIA

APN 242-020-34
MITSUNAGA

APN 242-020-50
PEREZ

APN 24
KI

SEE SHEET 5C

LEGEND

DRAINAGE WATERSHED BOUNDARY

FLOW DIRECTION

0 200 400 600

SCALE 1" =200'

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ONSITE PROPOSED CONDITION HYDROLOGY

SAFARI HIGHLANDS RANCH

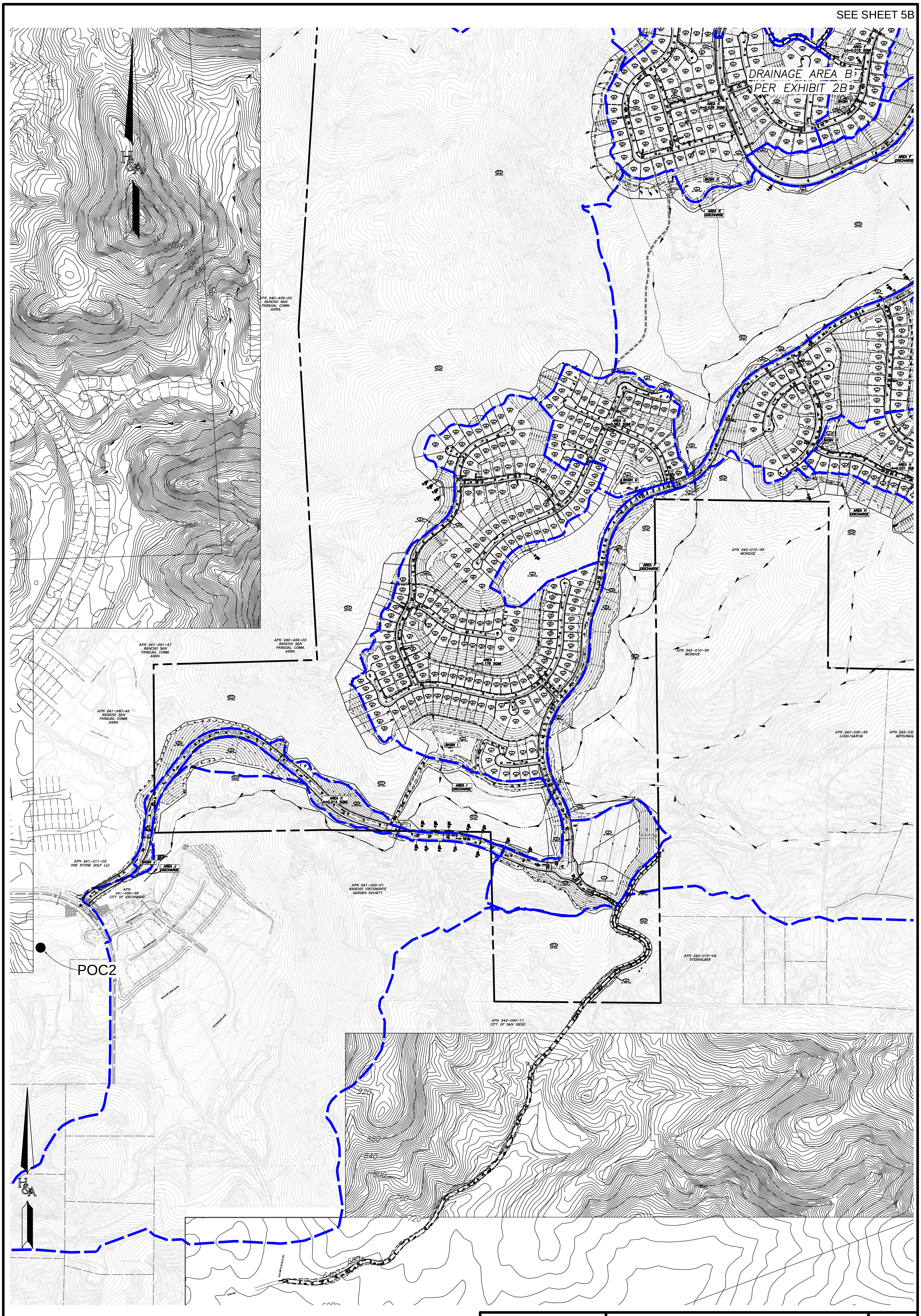
DRAINAGE AREA A

CITY OF ESCONDIDO, CA

EXHIBIT **3B**

W.O. 2321-0016

R:\1211\&Hyd\ACAD\EXIBIT 3A-Proposed Condition.dwg[]Sep-16-2016:12:08



LEGEND

DRAINAGE WATERSHED BOUNDARY

FLOW DIRECTION

0 200 400 600

SCALE 1" =200'

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ONSITE PROPOSED CONDITION HYDROLOGY

SAFARI HIGHLANDS RANCH

DRAINAGE AREA A

CITY OF ESCONDIDO, CA

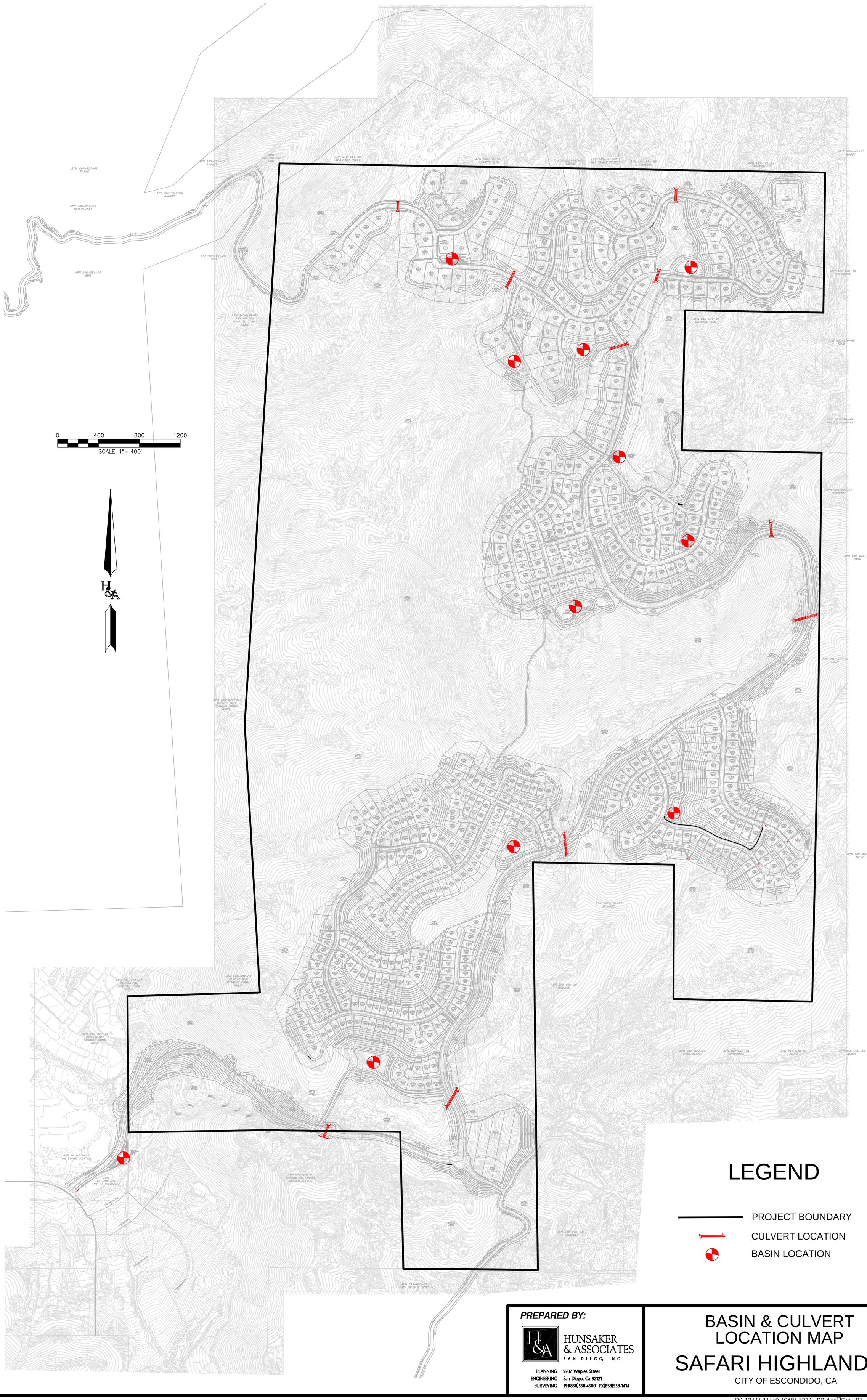
EXHIBIT

3C

W.O. 2321-0016

R:\1211\&Hyd\ACAD\EXHIBIT 3A-Proposed Condition.dwg[]Sep-16-2016:12:30

Appendix 8 – Basin and Culvert Location Exhibit



LEGEND

- PROJECT BOUNDARY
- CULVERT LOCATION
- BASIN LOCATION

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BASIN & CULVERT LOCATION MAP

SAFARI HIGHLANDS

CITY OF ESCONDIDO, CA

W.O. 2321-0016

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Appendix 9 – Culvert Analysis

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 1a

Invert Elev Dn (ft)	=	1505.00
Pipe Length (ft)	=	170.00
Slope (%)	=	4.71
Invert Elev Up (ft)	=	1513.00
Rise (in)	=	48.0
Shape	=	Circular
Span (in)	=	48.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

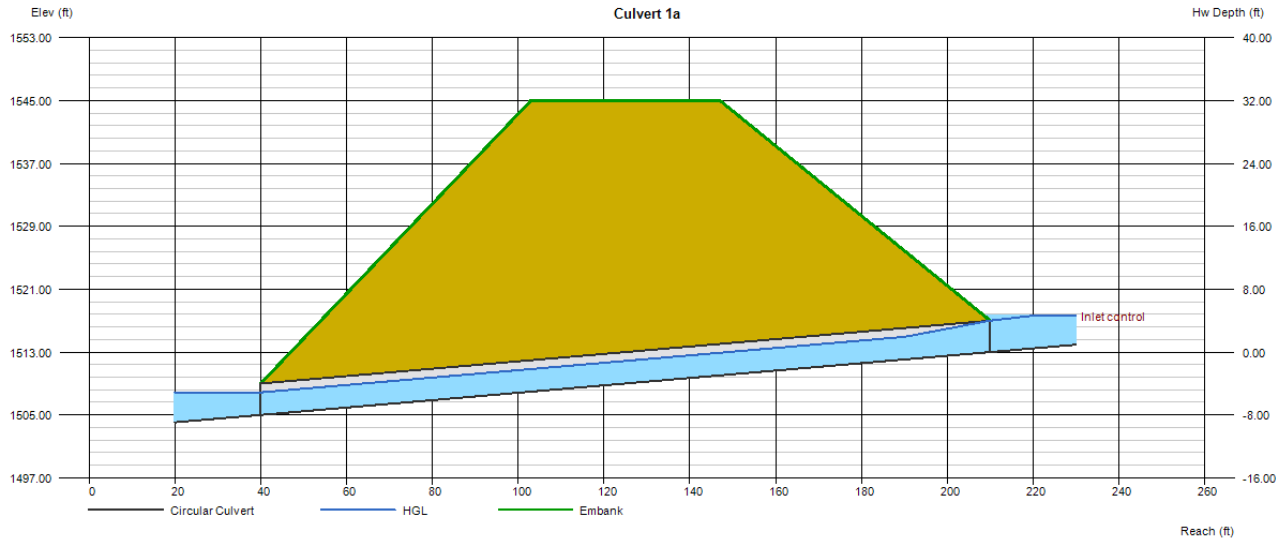
Top Elevation (ft)	=	1545.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	93.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	90.00
Qpipe (cfs)	=	90.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.31
Veloc Up (ft/s)	=	9.31
HGL Dn (ft)	=	1507.87
HGL Up (ft)	=	1515.87
Hw Elev (ft)	=	1517.63
Hw/D (ft)	=	1.16
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 2a

Invert Elev Dn (ft)	=	1615.00
Pipe Length (ft)	=	119.00
Slope (%)	=	4.20
Invert Elev Up (ft)	=	1620.00
Rise (in)	=	60.0
Shape	=	Circular
Span (in)	=	60.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

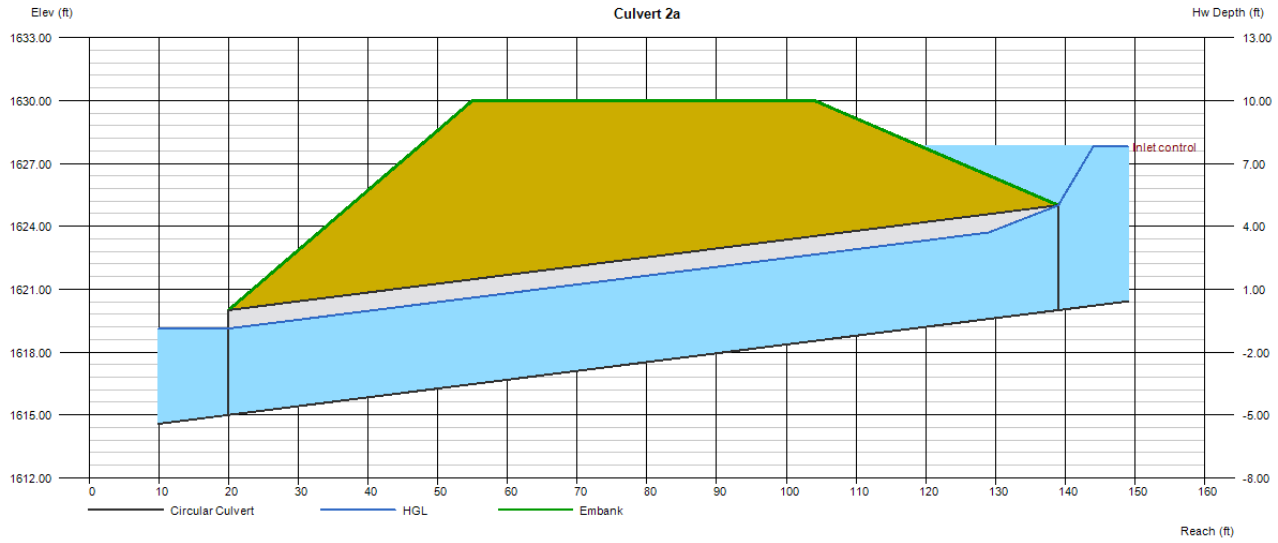
Top Elevation (ft)	=	1630.00
Top Width (ft)	=	49.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	432.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	420.00
Qpipe (cfs)	=	420.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	12.13
Veloc Up (ft/s)	=	12.13
HGL Dn (ft)	=	1619.12
HGL Up (ft)	=	1624.12
Hw Elev (ft)	=	1627.80
Hw/D (ft)	=	1.56
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 3a

Invert Elev Dn (ft)	=	1585.00
Pipe Length (ft)	=	110.00
Slope (%)	=	4.55
Invert Elev Up (ft)	=	1590.00
Rise (in)	=	60.0
Shape	=	Circular
Span (in)	=	60.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

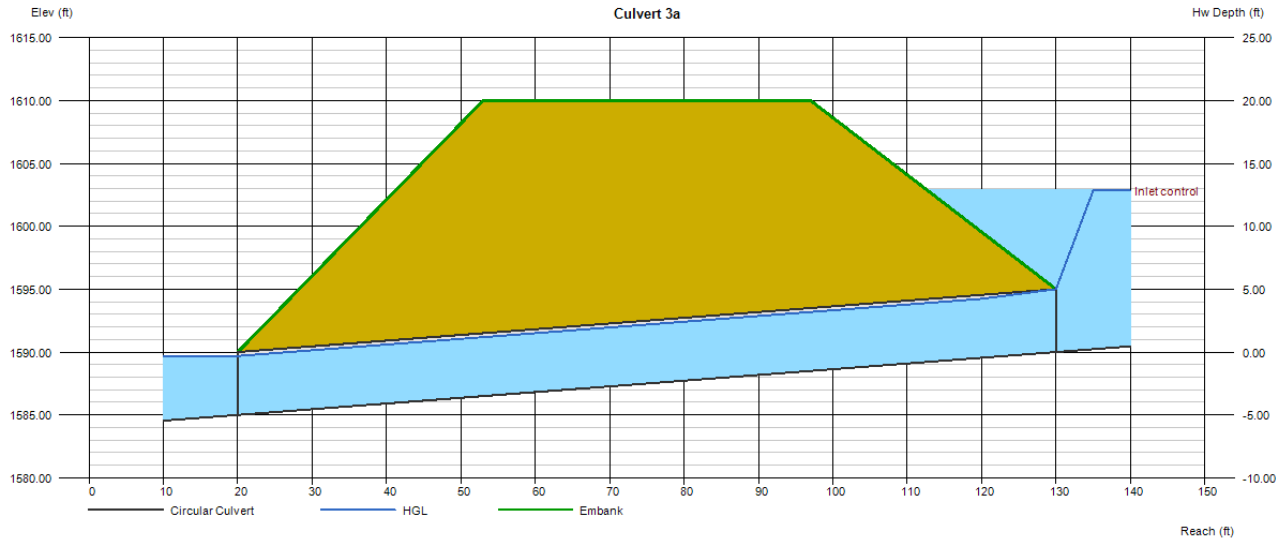
Top Elevation (ft)	=	1610.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	610.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	610.00
Qpipe (cfs)	=	610.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	15.95
Veloc Up (ft/s)	=	15.95
HGL Dn (ft)	=	1589.69
HGL Up (ft)	=	1594.69
Hw Elev (ft)	=	1602.84
Hw/D (ft)	=	2.57
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 4a

Invert Elev Dn (ft)	=	1530.00
Pipe Length (ft)	=	168.00
Slope (%)	=	8.93
Invert Elev Up (ft)	=	1545.00
Rise (in)	=	72.0
Shape	=	Circular
Span (in)	=	72.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

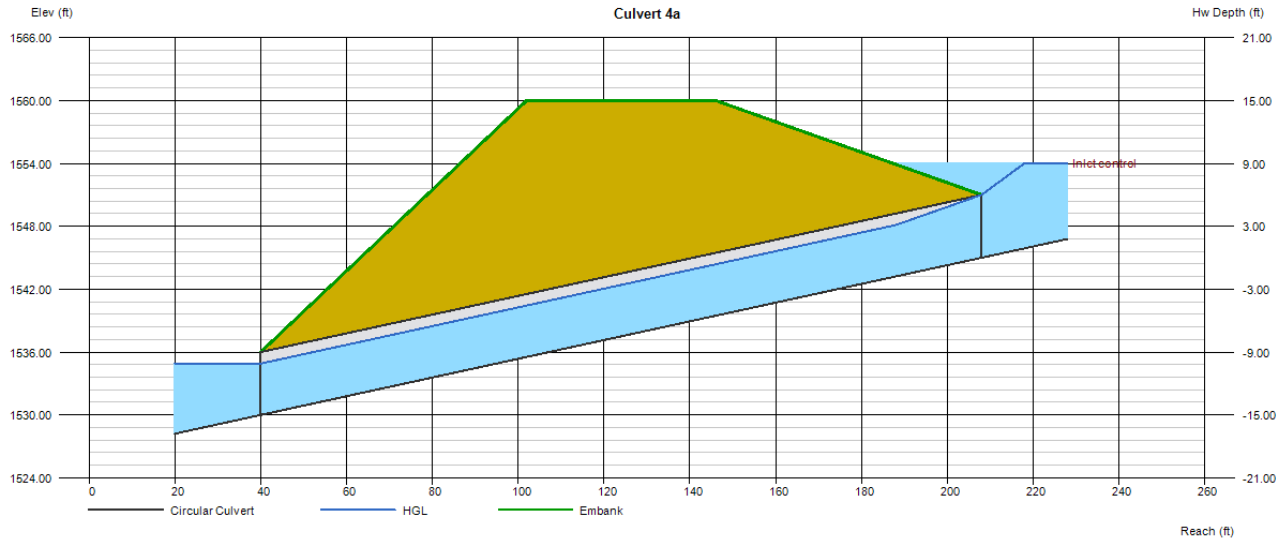
Top Elevation (ft)	=	1560.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	677.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	650.00
Qpipe (cfs)	=	650.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	13.13
Veloc Up (ft/s)	=	13.13
HGL Dn (ft)	=	1534.91
HGL Up (ft)	=	1549.91
Hw Elev (ft)	=	1554.01
Hw/D (ft)	=	1.50
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 5a

Invert Elev Dn (ft)	=	1606.00
Pipe Length (ft)	=	70.00
Slope (%)	=	5.71
Invert Elev Up (ft)	=	1610.00
Rise (in)	=	48.0
Shape	=	Circular
Span (in)	=	48.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

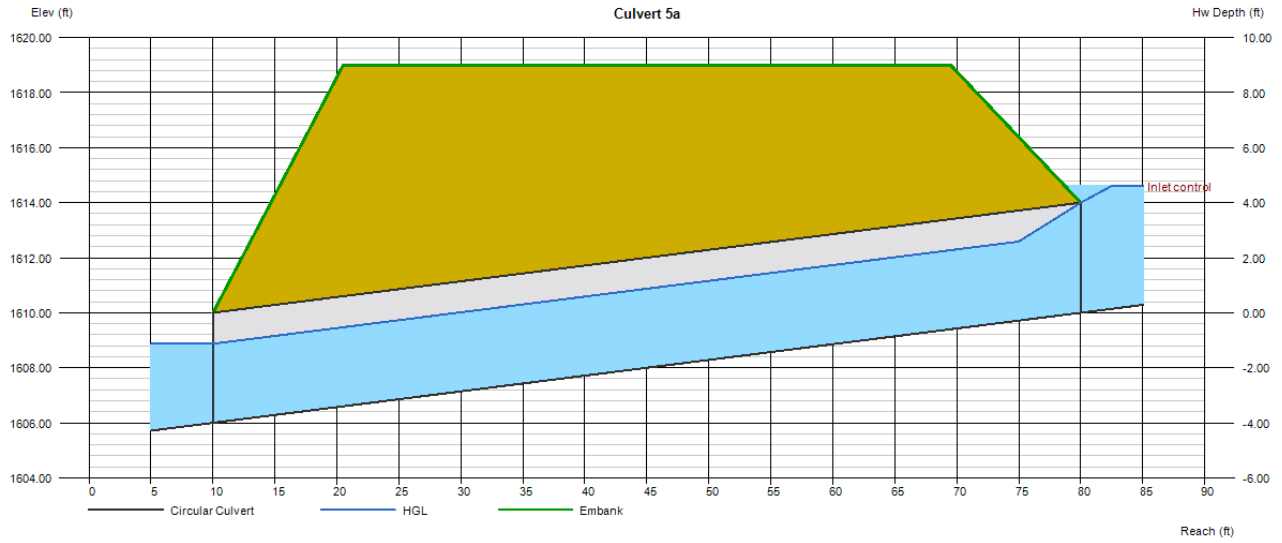
Top Elevation (ft)	=	1619.00
Top Width (ft)	=	49.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	94.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	90.00
Qpipe (cfs)	=	90.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.31
Veloc Up (ft/s)	=	9.31
HGL Dn (ft)	=	1608.87
HGL Up (ft)	=	1612.87
Hw Elev (ft)	=	1614.61
Hw/D (ft)	=	1.15
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 1b

Invert Elev Dn (ft)	=	1390.00
Pipe Length (ft)	=	126.00
Slope (%)	=	39.68
Invert Elev Up (ft)	=	1440.00
Rise (in)	=	72.0
Shape	=	Box
Span (in)	=	84.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

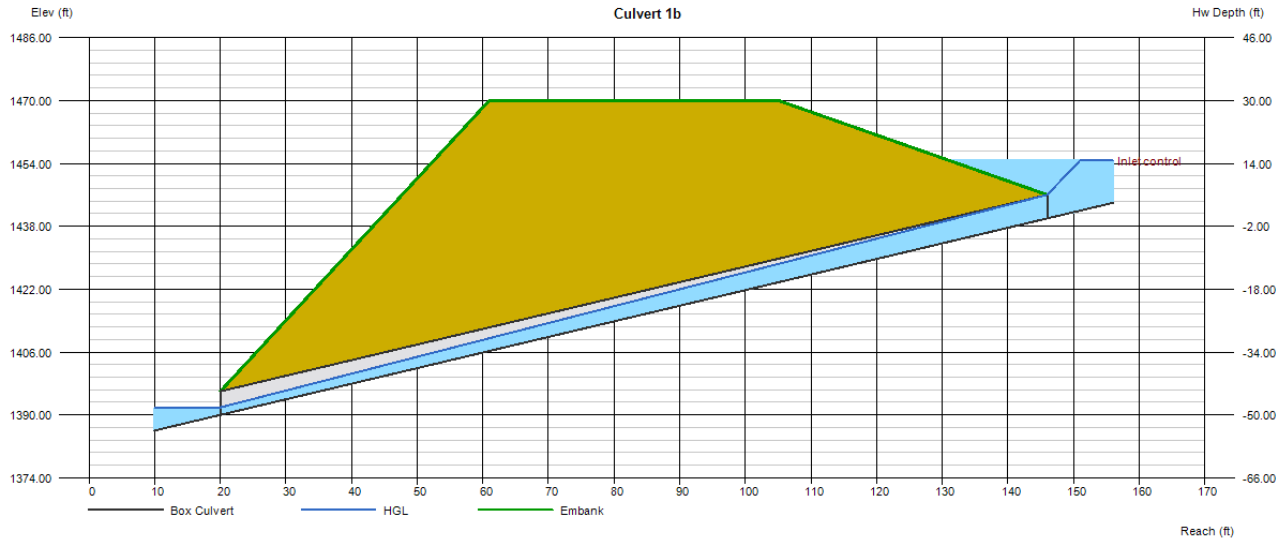
Top Elevation (ft)	=	1470.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	1500.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	1500.00
Qpipe (cfs)	=	1500.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	56.10
Veloc Up (ft/s)	=	17.86
HGL Dn (ft)	=	1391.91
HGL Up (ft)	=	1446.00
Hw Elev (ft)	=	1454.74
Hw/D (ft)	=	2.46
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 2b

Invert Elev Dn (ft)	=	1280.00
Pipe Length (ft)	=	200.00
Slope (%)	=	15.00
Invert Elev Up (ft)	=	1310.00
Rise (in)	=	72.0
Shape	=	Box
Span (in)	=	72.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

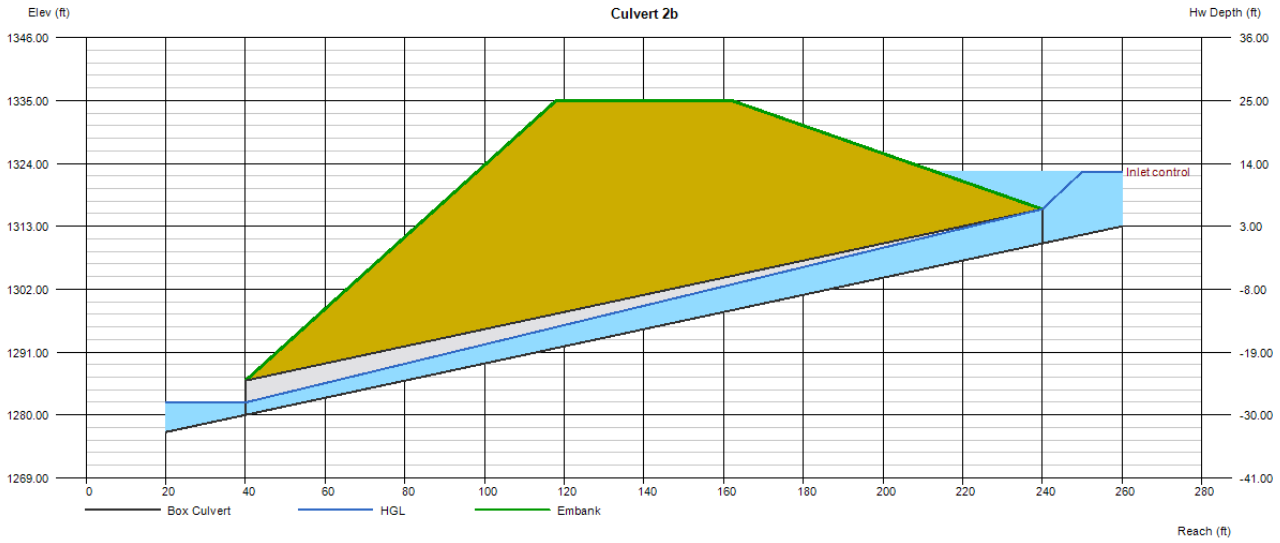
Top Elevation (ft)	=	1335.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	25.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	577.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	550.00
Qpipe (cfs)	=	550.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	42.05
Veloc Up (ft/s)	=	15.28
HGL Dn (ft)	=	1282.18
HGL Up (ft)	=	1316.00
Hw Elev (ft)	=	1322.51
Hw/D (ft)	=	2.08
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 3b

Invert Elev Dn (ft)	=	1040.00
Pipe Length (ft)	=	200.00
Slope (%)	=	10.00
Invert Elev Up (ft)	=	1060.00
Rise (in)	=	96.0
Shape	=	Box
Span (in)	=	96.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

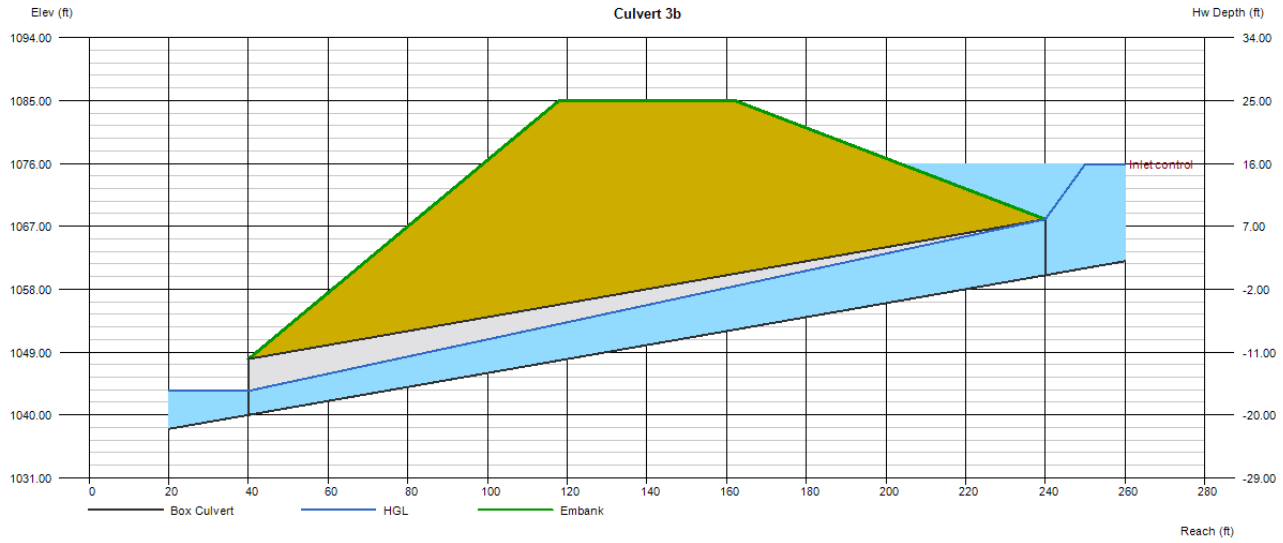
Top Elevation (ft)	=	1085.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	2150.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	2150.00
Qpipe (cfs)	=	2150.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	39.06
Veloc Up (ft/s)	=	16.80
HGL Dn (ft)	=	1043.44
HGL Up (ft)	=	1068.00
Hw Elev (ft)	=	1075.87
Hw/D (ft)	=	1.98
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 4b

Invert Elev Dn (ft)	=	840.00
Pipe Length (ft)	=	189.00
Slope (%)	=	2.12
Invert Elev Up (ft)	=	844.00
Rise (in)	=	96.0
Shape	=	Box
Span (in)	=	120.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

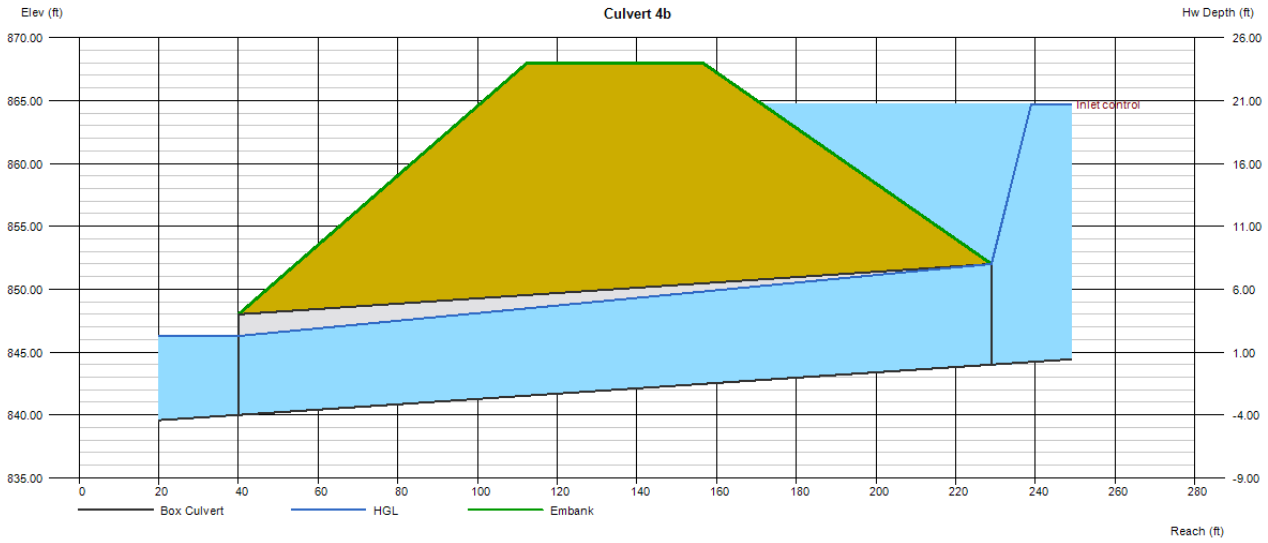
Top Elevation (ft)	=	868.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	3260.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	3250.00
Qpipe (cfs)	=	3250.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	25.88
Veloc Up (ft/s)	=	20.31
HGL Dn (ft)	=	846.28
HGL Up (ft)	=	852.00
Hw Elev (ft)	=	864.71
Hw/D (ft)	=	2.59
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Culvert 5b

Invert Elev Dn (ft)	=	784.00
Pipe Length (ft)	=	126.00
Slope (%)	=	12.70
Invert Elev Up (ft)	=	800.00
Rise (in)	=	120.0
Shape	=	Box
Span (in)	=	144.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

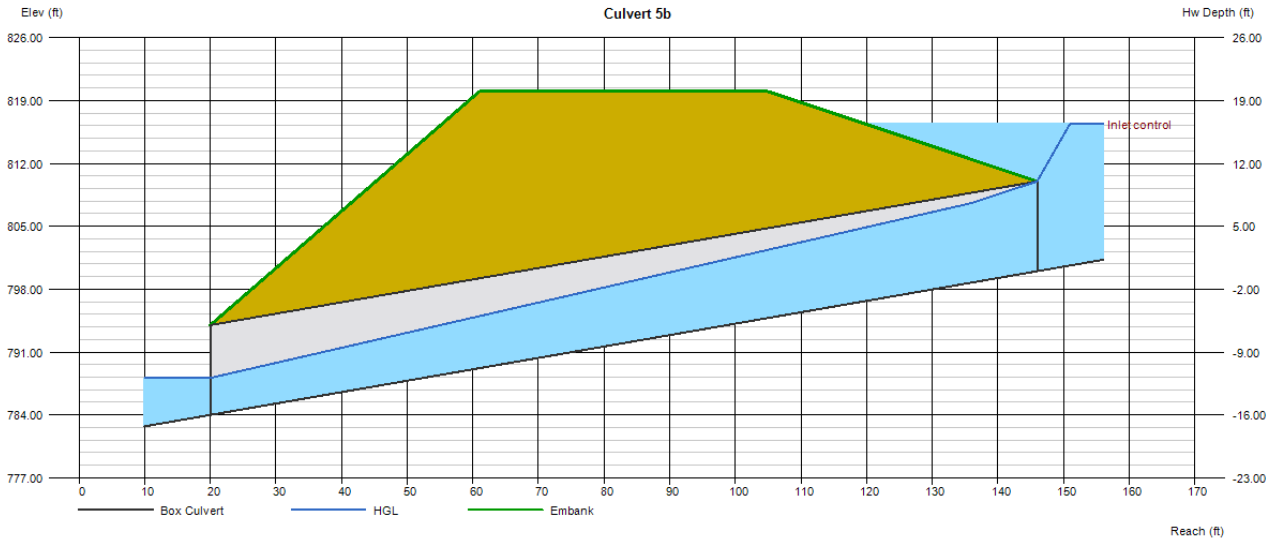
Top Elevation (ft)	=	820.00
Top Width (ft)	=	44.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	3860.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	3850.00
Qpipe (cfs)	=	3850.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	38.94
Veloc Up (ft/s)	=	17.32
HGL Dn (ft)	=	788.12
HGL Up (ft)	=	809.26
Hw Elev (ft)	=	816.39
Hw/D (ft)	=	1.64
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Sunday, Apr 23 2017

CULVERT 1C

Invert Elev Dn (ft)	=	1310.00
Pipe Length (ft)	=	92.60
Slope (%)	=	13.00
Invert Elev Up (ft)	=	1322.04
Rise (in)	=	60.0
Shape	=	Circular
Span (in)	=	60.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

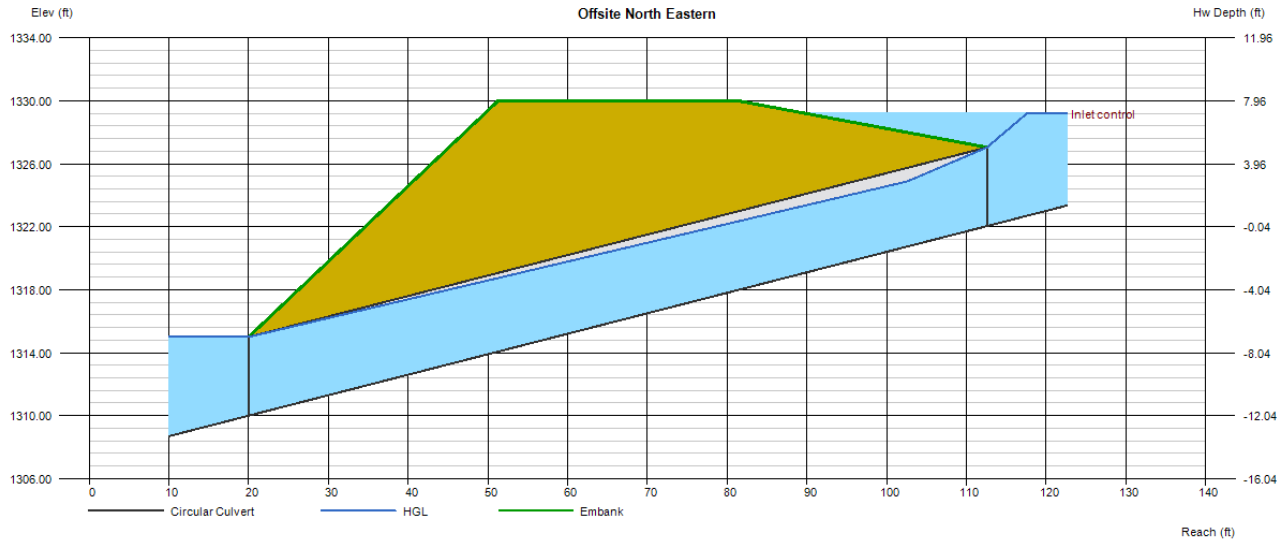
Top Elevation (ft)	=	1330.00
Top Width (ft)	=	30.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	100.00
Qmax (cfs)	=	201.00
Tailwater Elev (ft)	=	Crown

Highlighted

Qtotal (cfs)	=	200.00
Qpipe (cfs)	=	200.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	10.19
Veloc Up (ft/s)	=	11.78
HGL Dn (ft)	=	1315.00
HGL Up (ft)	=	1326.07
Hw Elev (ft)	=	1329.19
Hw/D (ft)	=	1.43
Flow Regime	=	Inlet Control



Culvert Report

CULVERT 1D

Invert Elev Dn (ft)	= 520.00
Pipe Length (ft)	= 50.00
Slope (%)	= 2.00
Invert Elev Up (ft)	= 521.00
Rise (in)	= 144.0
Shape	= Box
Span (in)	= 120.0
No. Barrels	= 3
n-Value	= 0.012
Culvert Type	= Flared Wingwalls
Culvert Entrance	= 30D to 75D wingwall flares
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4

Embankment

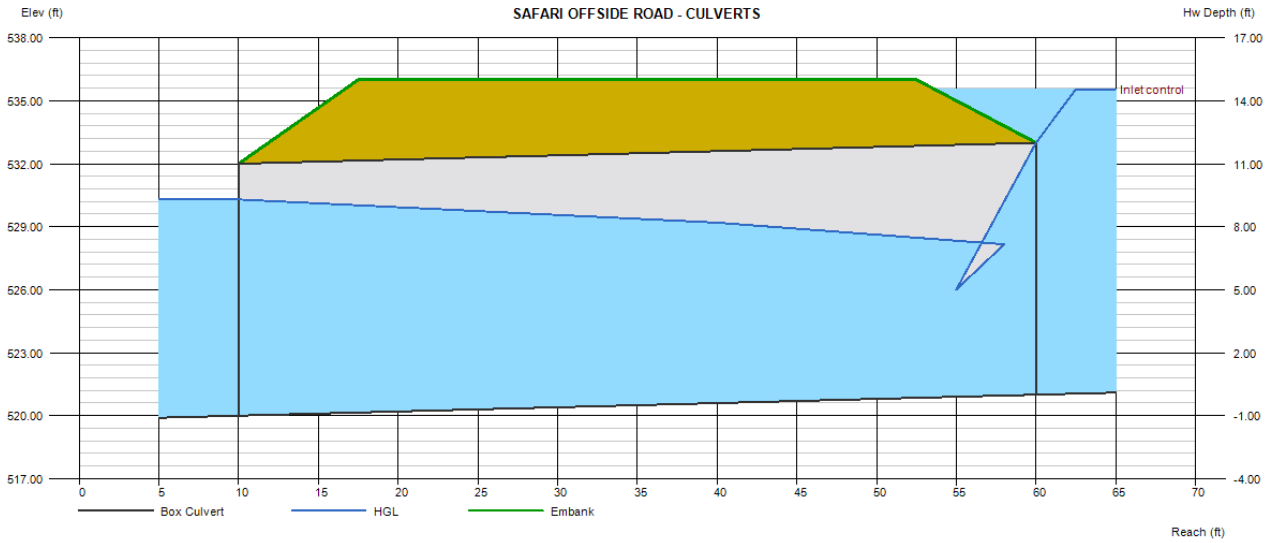
Top Elevation (ft)	= 536.00
Top Width (ft)	= 35.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 4300.00
Qmax (cfs)	= 7500.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 4300.00
Qpipe (cfs)	= 4300.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 13.92
Veloc Up (ft/s)	= 16.68
HGL Dn (ft)	= 530.30
HGL Up (ft)	= 529.59
Hw Elev (ft)	= 535.55
Hw/D (ft)	= 1.21
Flow Regime	= Inlet Control



Appendix 10 – Stage Storage Discharge

Basin A

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1585.0	0.00
1585.5	0.01
1586.0	0.04
1586.5	0.05
1587.0	0.06
1587.5	11.85
1588.0	33.38
1588.5	61.27
1589.0	94.29

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1585.0	0.217
1585.5	0.238
1586.0	0.259
1586.5	0.281
1587.0	0.302
1587.5	0.326
1588.0	0.349
1588.5	0.372
1589.0	0.394

Basin B

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1498.0	0.00
1499.0	0.01
1500.0	0.06
1501.0	0.08
1502.0	0.10
1503.0	0.11
1504.0	4.80
1505.0	18.85
1506.0	69.95
1507.0	141.82

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1498.0	0.408
1499.0	0.451
1500.0	0.494
1501.0	0.538
1502.0	0.586
1503.0	0.634
1504.0	0.683
1505.0	0.734
1506.0	0.786
1507.0	0.838

Basin C

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1539.0	0.00
1539.5	0.01
1540.0	0.04
1540.5	0.05
1541.0	0.06
1541.5	0.07
1542.0	0.08
1542.5	0.09
1543.0	0.10
1543.5	0.11
1544.0	0.12
1544.5	3.08
1545.0	4.80
1545.5	17.82
1546.0	40.38
1546.5	69.15
1547.0	102.96
1547.5	141.14
1548.0	183.22

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1539.0	0.3462
1539.5	0.3660
1540.0	0.3857
1540.5	0.4065
1541.0	0.4273
1541.5	0.4488
1542.0	0.4704
1542.5	0.4930
1543.0	0.5155
1543.5	0.5398
1544.0	0.5640
1544.5	0.5886
1545.0	0.6131
1545.5	0.6389
1546.0	0.6647
1546.5	0.6922
1547.0	0.7197
1547.5	0.7491
1548.0	0.7786

Basin D

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1614.0	0.00
1614.5	0.01
1615.0	0.04
1615.5	0.05
1616.0	0.06
1616.5	0.07
1617.0	0.08
1617.5	0.09
1618.0	0.10
1618.5	0.11
1619.0	0.12
1619.5	3.08
1620.0	4.80
1620.5	6.05
1621.0	7.08
1621.5	7.97
1622.0	8.77
1622.5	9.51
1623.0	10.19
1623.5	10.83
1624.0	23.21
1624.5	45.31
1625.0	73.73

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1614.0	0.340
1614.5	0.360
1615.0	0.380
1615.5	0.401
1616.0	0.421
1616.5	0.443
1617.0	0.464
1617.5	0.486
1618.0	0.508
1618.5	0.530
1619.0	0.553
1619.5	0.576
1620.0	0.600
1620.5	0.623
1621.0	0.647
1621.5	0.672
1622.0	0.697
1622.5	0.723
1623.0	0.749
1623.5	0.777
1624.0	0.806
1624.5	0.835
1625.0	0.864

Basin F'

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1585.0	0.00
1585.5	0.01
1586.0	0.04
1586.5	0.05
1587.0	0.06
1587.5	0.07
1588.0	0.08
1588.5	0.09
1589.0	11.87
1589.5	33.41
1590.0	61.29

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1585.0	0.031
1585.5	0.038
1586.0	0.046
1586.5	0.053
1587.0	0.061
1587.5	0.068
1588.0	0.076
1588.5	0.085
1589.0	0.094
1589.5	0.103
1590.0	0.113

Basin D

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1525.0	0.000
1525.5	0.000
1526.0	0.000
1526.5	0.000
1527.0	0.000
1527.5	9.990
1528.0	28.260
1528.5	51.920
1529.0	64.140
1529.5	71.720
1530.0	78.560
1530.5	84.860
1531.0	90.710

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1525.0	0.920
1526.0	0.962
1530.0	1.146
1531.0	1.199

Basin E

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1628.0	0.000
1628.5	0.000
1629.0	0.000
1629.5	0.000
1630.0	0.000
1630.5	0.000
1631.0	0.000
1631.5	0.000
1632.0	0.000
1632.5	7.490
1633.0	21.200
1633.5	31.250
1634.0	36.080
1634.5	40.340

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1628.0	0.212
1629.0	0.230
1630.0	0.254
1634.8	0.355

Basin F

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1060.0	0.000
1060.5	0.000
1061.0	0.000
1061.5	0.000
1062.0	0.000
1062.5	0.000
1063.0	9.990
1063.5	28.260
1064.0	51.920
1064.5	64.140
1065.0	71.720
1065.5	78.560
1066.0	84.860
1066.5	90.710
1067.0	96.220

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1060.0	0.877
1061.0	0.921
1065.0	1.104
1067.0	1.214
1068.0	1.270

Basin G

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
1244.0	0.000
1244.5	0.000
1245.0	0.000
1245.5	0.000
1246.0	0.000
1246.5	7.490
1247.0	21.200
1247.5	31.250
1248.0	36.080
1248.5	40.340
1249.0	44.190
1249.5	47.730
1250.0	51.030

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
1244.0	0.354
1245.0	0.382
1250.0	0.541

Basin H

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
855.0	0.000
855.5	0.000
856.0	0.000
856.5	0.000
857.0	0.000
857.5	0.000
858.0	0.000
858.5	0.000
859.0	9.990
859.5	28.260
860.0	51.920
860.5	64.140
861.0	71.720
861.5	78.560
862.0	84.860
862.5	90.710
863.0	96.220
863.5	101.420
864.0	106.370
864.5	111.100
865.0	115.640

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
855.0	1.648
856.0	1.702
860.0	1.999
865.0	2.362

Basin K

Elevation Discharge Table

Paired Data | Table | Graph

Elevation (FT)	Discharge (CFS)
416.0	0.000
416.5	0.000
417.0	0.000
417.5	0.000
418.0	0.000
418.5	0.000
419.0	0.000
419.5	0.000
420.0	0.000
420.5	7.490
421.0	21.200
421.5	31.250
422.0	36.080

Elevation Area Table

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
416.0	0.176
417.0	0.200
420.0	0.286
422.0	0.355