Table 2.0-1R (Sheet 9 of 14)
Key Site Parameters

CP COL 2.1(1)
CP COL 2.2(1)
CP COL 2.3(1)
CP COL 2.3(2)
CP COL 2.3(3)
CP COL 2.4(1)
CP COL 2.5(1)

CTS-01125

~~A/B releases (reactor coolant system sample line~~ ~~0-8 hrs~~ ~~8-24 hrs~~ ~~1-4 days~~ ~~4-30 days~~	 ~~4.9×10^{-3} s/m^3~~ ~~2.9×10^{-3} s/m^3~~ ~~1.8×10^{-3} s/m^3~~ ~~8.1×10^{-4} s/m^3~~	~~Dispersion of releases from the reactor coolant sampling line are bounded by the dispersion values for the plant vent.~~
~~Air lock releases in containment~~ ~~0-8 hrs~~ ~~8-24 hrs~~ ~~1-4 days~~ ~~4-30 days~~	 ~~6.4×10^{-3} s/m^3~~ ~~3.8×10^{-3} s/m^3~~ ~~2.4×10^{-3} s/m^3~~ ~~1.1×10^{-3} s/m^3~~	~~χ/Q values for the air lock releases in containment are bounded by the χ/Q for the Containment Shell release.~~
Hydrologic Engineering		
Parameter Description	**Parameter Value**	
	DCD	**CPNPP 3 and 4**
Maximum flood (or tsunami) level	1 ft below plant grade	~~790.9~~793.66 ft msl for SCR ~~820.83~~820.90 ft msl for a Local Intense Precipitation at units 3 and 4 site.
Maximum rainfall rate (hourly)	19.4 in/hr for seismic category I/II structures	19.0 in/hr
Maximum rainfall rate (short-term)	6.3 in/5 min for seismic category I/II structures	6.2 in/5 min
Maximum groundwater level	1 ft below plant grade	1 ft below plant grade

RCOL2_02.04.03-5
RCOL2_02.04.02-2

CP COL 2.1(1)
CP COL 2.2(1)

2.4.3 Probable Maximum Flood

CP COL 2.4(1) ~~Replace the content~~Add the following at the end of DCD Subsection 2.4.3 ~~with the following~~. RCOL2_02.04-1

The guidance in Appendix A of the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.59 was followed in determining the PMF by applying the guidance of ANSI/ANS-2.8-1992 (Reference 2.4-229). ANSI/ANS-2.8-1992 was issued to supersede ANSI N170-1976, which is referred to by Regulatory Guide 1.59. ANSI/ANS-2.8-1992 is the latest available standard.

The PMF was determined for the Squaw Creek watershed and routed through the SCR to determine a water surface elevation of ~~790.9~~793.66 ft msl. The PMF for the Paluxy River watershed at the confluence with the Brazos River was also examined. The PMF for the Paluxy River and the Squaw Creek watersheds was combined with the Brazos River dam failure flood flow to determine any backwater effects that may affect the site. The Brazos River dam failure flood flow is described in Subsection 2.4.4 and includes the PMF for the Brazos River. The resulting water surface elevation downstream of the Squaw Creek Dam is ~~755.21~~761.05 ft msl. RCOL2_02.04.03-5 RCOL2_02.04.03-5

The CPNPP Units 3 and 4 safety-related facilities are located at elevation 822 ft msl. Therefore, PMF on rivers and streams does not present any potential hazards for CPNPP Units 3 and 4 safety-related facilities.

2.4.3.1 Probable Maximum Precipitation

The PMP is defined by HMR 51 (Reference 2.4-218) and HMR 52 (Reference 2.4-219). HMR 53 (Reference 2.4-230) may be used to derive seasonal estimates of the PMP. The PMP was determined for the Squaw Creek ~~and the~~watershed and the combined Squaw Creek and Paluxy River watersheds to maximize the effects of flooding downstream of the SCR. Using the location of the watersheds, HMR 51 PMP charts are used to determine generalized estimates of the all-season PMP for drainage areas from 10 to 20,000 sq mi for durations from 6 to 72 hr. The resulting depth-area-duration (DAD) values are shown in Table 2.4.3-201. RCOL2_02.04.03-5

HMR 52 is used to determine the aerial distribution of PMP estimates derived from HMR 51. The recommended elliptical isohyetal pattern from HMR 52, shown in Figure 2.4.3-201, is used for the watersheds. The watershed model, combining both watersheds, contains 4 subbasins and is shown in Figure 2.4.3-202. The watershed model is discussed in detail in Subsection 2.4.3.3.

HMR 52 computer software (Reference 2.4-231), developed by USACE, is used to determine the optimum storm size and orientation to produce the greatest PMP over the watersheds using the HMR 51 derived DAD table. Several storm centers were examined for each watershed to determine the critical storm center.

In accordance with Appendix A of Regulatory Guide 1.59, the 72-hr PMP storm is combined with an antecedent storm equal to 40 percent of the PMP. Therefore, the complete sequential storm considered includes a 3-day, 40 percent PMP event followed by a 3-day dry period, which is followed by the 3-day full PMP event. Critical temporal distribution was determined by runoff analysis. Multiple temporal distributions were examined, including one-third, center, two-thirds, and end peaking arrangements.

Considering only the SCR watershed, Basin 1, the critical storm center for the SCR watershed was found to be near the Squaw Creek watershed centroid, identified as point SC X in Figure 2.4.3-202. A storm center at SC2 results in the maximum PMP for the SCR watershed. However, the storm center SC X results in a higher runoff and hence SC X is considered to be the critical storm center for the SCR watershed. The critical storm area was found to be 100 sq mi, corresponding to isohyet D in Figure 2.4.3-201. The critical storm orientation was found to be 181 degrees. RCOL2_02.04.03-5

The critical 72-hr storm PMP rainfall total is 42.53 in for the SCR watershed. The standard HMR 52 temporal arrangement of 6-hr precipitation increments is provided in Table 2.4.3-208. The critical temporal distribution was determined by the runoff analyses to be a two-thirds peaking arrangement for the SCR watershed. The hourly temporal distribution of the 72-hr PMP rainfall for the SCR watershed, Basin 1, is provided in Table 2.4.3-209. The corresponding hyetograph is shown in Figure 2.4.3-211.

For the remaining portion of the Squaw Creek watershed and the Paluxy River watershed, the critical PMP for each basin was determined considering the combined areas for both watersheds.

For the remaining portion of the Squaw Creek watershed, Basin 2, the critical storm center was found to be near the watershed centroid, identified as point SC X in Figure 2.4.3-202. A storm center at SC2 results in the maximum PMP for the Squaw Creek watershed. The storm center SC X results in a higher runoff and hence SC X is considered to be the critical storm center for the Squaw Creek watershed. The critical storm area was found to be 700 sq mi, corresponding to isohyet H in Figure 2.4.3-201. The critical storm orientation was found to be 145 degrees.

The critical 72-hr storm PMP rainfall total is 38.46 in for the Squaw Creek watershed. The standard HMR 52 temporal arrangement of 6-hr precipitation increments is provided in Table 2.4.3-202. The critical temporal distribution was determined by runoff analysis to be an two-thirds peaking arrangement for the Squaw Creek watershed. The hourly end temporal distribution of the 72-hr PMP rainfall for ~~each of the 4 subbasins~~Basin 2 is provided in Table 2.4.3-203. The corresponding hyetograph is shown in Figure 2.4.3-203. RCOL2_02.04.03-5

For the Paluxy River watershed, Basins 3 and 4 are the critical storm center was found to be near the watershed centroid, identified as point PR Y in Figure 2.4.3- RCOL2_02.04.03-5

202. The critical storm area was found to be 450 sq mi, corresponding to isohyet G in Figure 2.4.3-201. The critical storm orientation was found to be 172 degrees.

The critical 72-hr storm PMP rainfall total is 35.08 in for the Paluxy River watershed. The standard HMR 52 temporal arrangement of 6-hr precipitation increments is provided in Table 2.4.3-204. The critical temporal distribution was determined by runoff analysis to be a ~~one-third~~center peaking arrangement for the Paluxy River watershed. The hourly temporal distributions of the 72-hr PMP rainfall for ~~each of the 4 subbasins is~~Basins 3 and 4 are provided in Table 2.4.3-205. The corresponding hyetographs are ~~is~~ shown in Figure 2.4.3-204 and 2.4.3-212. RCOL2_02.04.03-5

The watersheds do not occur in the orographic regions identified by HMR 51 and HMR 52. Additionally, the area does not contain significant changes in elevation that would require modification to the PMP. Therefore, orographic effects are not considered.

According to HMR 53, the all-season PMP estimates are associated with the warmer summer months. HMR 53 winter precipitation estimates are greatly reduced compared to the all-season PMP estimates. Additionally, snowmelt does not contribute significantly to river floods anywhere in the state (Reference 2.4-214). Therefore, snowmelt is not considered to be a factor in modeling the PMF event.

The potential dam failures consider coincident PMF flows for the Brazos River watershed. The PMP for the Brazos River was not determined. The approach detailed in Appendix B of Regulatory Guide 1.59 was used to derive the peak PMF flow directly. Potential dam failures are discussed in Subsection 2.4.4.

2.4.3.2 Precipitation Losses

~~Precipitation losses are based on the existing evaluation for CPNPP Units 1 and 2. According to CPNPP Units 1 and 2 FSAR, an initial loss of 0.5 in and a conservative infiltration rate of 0.1 in/hr were determined from USACE records of the Paluxy River watershed (Reference 2.4-214). The recorded Paluxy watershed losses are provided in Table 2.4.3-206.~~ RCOL2_02.04.03-5

For evaluation of CPNPP Units 3 and 4, no initial losses were assumed, indicating saturated antecedent moisture conditions at the onset of the antecedent storm. This assumption is more conservative than the guidance provided in ANSI/ANS-2.8-1992. ~~A constant loss rate of 0.1 in/hr was used in the runoff model.~~Additionally, no loss rate wasassumedfor the duration of the modeled events. All rainfall is transformed to runoff. The runoff model is described in Subsection 2.4.3.3. RCOL2_02.04.03-5

2.4.3.3 Runoff and Stream Course Models

The runoff and stream course models are based on an existing study for the SCR. The watershed and subbasins are shown in Figure 2.4.3-202. Basin 1 was further subdivided into three subbasins – 1a, 1b, and 1c. Basin 1a represents the drainage area above the SCR, Basin 1b represents the contributing area adjacent to the SCR, and Basin 1c represents the SCR. Drainage areas for each subbasin are provided in Table 2.4.3-207.

Based on USGS quadrangles, the topography of the Squaw Creek watershed generally slopes to the stream course running through the middle of the watershed. The stream course slopes to the southeast from about 1100 ft msl to a low point of 650 ft msl. However, the SCR has inundated elevations below 775 ft msl. The highest point in the basin is the plateau peak of the geographic feature Comanche Peak at elevation 1230 ft msl (Reference 2.4-237).

The Paluxy River basin generally slopes to the river course running through the middle of the watershed. The river course slopes to the southeast from about 1450 ft msl to a low point of 570 ft msl at the confluence with the Brazos River. The highest point in the basin is elevation 1490 ft msl (Reference 2.4-237).

The USACE HEC-HMS, Version ~~3.1.0~~3.4 (Reference 2.4-232), modeling software was used for rainfall runoff and routing calculations. The HEC-HMS model watershed routing layout is shown in Figure 2.4.3-205. The unit hydrographs for each basin were based on the existing study using the synthetic Snyder's Unit Hydrograph. Snyder's method was used for the CPNPP Units 1 and 2 unit hydrograph development (Reference 2.4-214), and is applicable under PMF conditions. The Snyder's method provided reasonable estimates for peak direct runoff rate at the CPNPP location and is acceptable in determining the peak direct runoff rate for the CPNPP Units 3 and 4. To represent a conservative approach, the basin characteristics resulting in higher runoff at the CPNPP Units 3 and 4 were used in the runoff model. ~~Lag times were developed based on the characteristics of each basin.~~ The basin characteristics ~~and lag times~~ are provided in Table 2.4.3-207. RCOL2_02.04.03-5

Basin area, length of stream, and length of stream to the basin centroid are measureable parameters. The basin areas from the existing study were confirmed based on USGS topography. The length of stream and the length of stream to the basin centroid were calculated and compared with the existing study results. The more conservative smaller values were used to determine unit hydrograph characteristics. RCOL2_02.04.03-5

Base flow was determined using the average monthly flow of the ~~9.7~~46 cfs from USGS Gage 08091750. The ~~lowest~~highest of these monthly flows was used as the base flow. Because the basin areas are different from gage area (70.3 sq mi), the base flow was adjusted on the basis of ratio of basin drainage area to the gage area. The adjusted baseflow was applied to the model as a constant rate and is provided in Table 2.4.3-207.

The Snyder's lag time coefficient and peaking coefficient were selected to maximize runoff. Lag time coefficients range from 1.8 to 2.2. However, lag time coefficients have been found to vary from 0.4 in mountainous areas to 8.0 along the Gulf of Mexico. Lower lag time coefficients are more conservative. Therefore, a 0.4 lag time coefficient has been selected. Peaking coefficients range from 0.4 to 0.8. Higher peaking coefficients are more conservative. Therefore, a 0.8 peaking coefficient has been selected. RCOL2_02.04.03-5

Using the watershed subbasin characteristics provided in Table 2.4.3-207, the Snyder's unit hydrograph method was applied to derive unit hydrographs for each subbasin. The resulting Snyder's unit hydrograph characteristics and equations utilized are provided in Table 2.4.3-210. To account for nonlinear basin response at high rainfall rates, the peak of the unit hydrograph for each subbasin has been increased by 20 percent. The unit hydrograph was then adjusted to maintain the unit hydrograph characteristic of 1 in of runoff. The derived and modified to account for nonlinear basin response unit hydrographs are provided for each subbasin. The Basin 1a and 1c unit hydrographs are shown in Figure 2.4.3-213. The Basin 1b unit hydrographs are shown in Figure 2.4.3-214. The Basin 2 unit hydrographs are shown in Figure 2.4.3-215. The Basin 3 unit hydrographs are shown in Figure 2.4.3-216. The Basin 4 unit hydrographs are shown in Figure 2.4.3-217.

The Muskingum-Cunge 8-point cross section method was used for the river routing reaches within the HEC-HMS model. Channel slope, length, and cross section data were developed using USGS quadrangles. Manning's roughness coefficients were based on the existing study and compared with accepted published tables by Chow (Reference 2.4-233). Squaw Creek Manning's roughness coefficients range from 0.06 for the channel to 0.09 for the overbanks. The Paluxy River Manning's roughness coefficients range from 0.045 for the channel to 0.07 for the overbanks. To account for variability and uncertainty, the Manning's roughness coefficient of 0.15 has been used within HEC-HMS and HEC-RAS.

SCR is the only significant reservoir within the Paluxy River and Squaw Creek watersheds. The storage-elevation ~~for the SCR was obtained from~~rating curve for the SCR is provided in Figure 2.4.3-206 and was obtained from the following two sources: RCOL2_02.04.03-5

- The storage-elevation data for elevation 775 ft msl and below have been obtained from ~~1997~~the TWDB Volumetric Survey for SCR conducted in 2007. (Reference 2.4-212) RCOL2_02.04.03-5
- The storage-elevation data for elevations above 775 ft msl have been obtained from ~~and~~ the Operation and Maintenance Procedures for Squaw Creek Dam prepared by Freese and Nichols in 1997. RCOL2_02.04.03-5

~~The storage-discharge curve for service and emergency spillways has been obtained from the Operation and Maintenance Procedure. The storage discharge~~ RCOL2_02.04.03-5 relationship was linearly extrapolated to account for discharge from elevation 791 ft msl to 795 ft. msl. The reservoir rating curve is presented in Figure 2.4.3-206. RCOL2_02.04.03-5

In order to project flows beyond those provided in the Operation and Maintenance Procedures for Squaw Creek Dam, the spillway rating curves have been reconstituted using the methods of the U.S. Bureau of Reclamation Design of Small Dams for the service spillway with an ogee crest and the methods of the Federal Highway Administration Hydraulic Design Series Number 5 for the emergency spillway. It is assumed that the ogee crest is submerged 1 ft by tailwater flooding up to elevation 776 ft. The ogee crest discharge coefficient was determined to range from 0 to 3.71 for an overtopping depth of 1 ft to 20 ft. Submergence effects cease as the depth of overtopping flow approaches 4 ft.

Although the emergency spillway crest is not affected by tailwater, submergence is accounted for based on the effects of flow in the channel immediately downstream from the spillway. The rating curve in the Operation and Maintenance Procedures accounts for downstream channel depth of flow from 100 percent to 90 percent of the overtopping headwater depth. Based on the effects of downstream flow, discharge coefficients were derived to range from 1.46 to 2.55 for an overtopping depth of 1 ft to 12 ft.

The combined service spillway and emergency spillway rating curve is provided in Figure 2.4.3-218.

Methods adopted to account for nonlinear basin response at high rainfall rates include no initial losses as discussed in Subsection 2.4.3.2 and the use of 40 percent PMP antecedent rainfall as discussed in Subsection 2.4.3.1. Snowmelt is not considered to be a factor in modeling the PMF event, as described in Subsection 2.4.3.1.

Because of large magnitude flows and potential backwater effects from flooding of the Paluxy River and the Brazos River, a standard step method, unsteady-flow hydraulic analysis was also performed to assess the resulting water surface elevation downstream of Squaw Creek Dam. The USACE HEC-RAS, Version 3.1.3 (Reference 2.4-234), modeling software was used to route the flood hydrographs obtained from the HEC-HMS model.

The Paluxy River reach through Basin 3 and the Squaw Creek reach through Basin 2 were included in the HEC-RAS model. Cross sections were estimated using the existing study and USGS quadrangles. Cross section interpolations were performed as necessary to provide a stabilized HEC-RAS model.

The Basin 1 hydrograph routed through the SCR and the Paluxy River Basin 3 hydrograph from the HEC-HMS analysis were used as upstream boundary input. The Basin 2 and Basin 4 hydrographs from the HEC-HMS analysis were included as lateral inflows. A constant stage hydrograph, due to the peak dam failure flow described in Subsection 2.4.4, was used as the boundary condition at the downstream end of the Paluxy River. This is a bounding condition including the conservative assumptions that multiple PMF scenarios occur coincidentally and that the peak domino-type dam failure effects are maintained at the confluence throughout the duration of the PMF. A computation interval of 5 min was used in the HEC-RAS model.

2.4.3.4 Probable Maximum Flood Flow

Applying the precipitation, described in Subsection 2.4.3.1, with the precipitation losses, described in Subsection 2.4.3.2, to the runoff model, described in Subsection 2.4.3.3, the SCR peak PMF inflow was determined to be ~~221,000~~319,000 cfs. The routed peak discharge from the SCR is ~~148,000~~206,000 cfs. The resulting inflow and outflow hydrographs are shown in Figure 2.4.3-207. Position of the storm and temporal distribution of the PMP is discussed in Subsection 2.4.3.1. Discussion of dam failure is provided in Subsection 2.4.4. There are no significant current or planned upstream structures. No credit is taken for the lowering of flood levels at the site due to downstream dam failure. RCOL2_02.04.03-5

Based on the individual basin controlling PMP, the peak flow for Squaw Creek Basin 2 was determined to be 37,600 cfs, using the two-thirds temporal distribution at the storm center SC X. The peak flow for Paluxy River Basin 3 was determined to be 85,000 cfs, using the center temporal distribution at the storm center PR Y. The peak flow for Paluxy River Basin 4 was determined to be 945,000 cfs, using the center temporal distribution at the storm center PR Y. RCOL2_02.04.03-5

Although the individual basin PMP distributions provide maximum peak flows, the temporal distributions are not aligned. The maximum backwater flow is determined using the center temporal distribution at the storm center PR Y for all basins. The maximum backwater flow on the downstream end of the Squaw Creek Dam is ~~88,130~~100,440 cfs. The associated backwater analysis does not provide the controlling PMF water surface elevation at the site.

2.4.3.5 Water Level Determinations

The PMF runoff, routed through the SCR, results in a peak water surface elevation of ~~790.9~~793.0 ft msl at CPNPP Units 3 and 4. The water surface elevation is determined using the HEC-HMS runoff and routing model as described in Subsection 2.4.3.3. The hydrograph for the SCR is provided in Figure 2.4.3-208. RCOL2_02.04.03-5

Elevations are provided with reference to the National Geodetic Vertical Datum of 1929 (NGVD 29). The plant site elevation is referenced to the North American Vertical Datum of 1988 (NAVD 88). According to the National Geodetic Survey (Reference 2.4-290), the datum shift of NAVD 88 minus NGVD 29 is equal to between 0 and +0.66 ft for the site. Therefore, it is conservative to account for a maximum conversion of +0.66 ft when comparing water surface elevations determined using NGVD 29 to elevations at the site in NAVD 88. Considering conversion, the SCR maximum water surface elevation of 793.66 ft NAVD 88 is RCOL2_02.04.03-5 well below the CPNPP Units 3 and 4 safety-related structures elevation of 822 ft NAVD 88. RCOL2_02.04.03-5

The standard step, unsteady-flow analysis for the Squaw Creek and the Paluxy River watersheds, resulted in a water surface elevation of ~~775.21~~760.39 ft msl on the downstream side of the SCR. The HEC-RAS model described in Subsection 2.4.3.3 was used to translate runoff to the water surface elevation. ~~The~~Considering datum conversion, the resulting elevation of ~~775.21~~761.05 ft msl is below the elevation of CPNPP Units 3 and 4 safety-related facilities and presents no hazard. In an unlikely event of achieving the water surface elevation described above, possible headcutting on the downstream slope of Squaw Creek could result in failure of the Squaw Creek Dam. However, failure would lower the water surface elevation of the SCR. RCOL2_02.04.03-5 RCOL2_02.04.03-5 RCOL2_02.04.03-11

2.4.3.6 Coincident Wind Wave Activity

Fetch length was estimated based on USGS Quadrangles and the PMF maximum water surface elevation of SCR. The critical fetch length was found to be ~~2.67~~2.7 mi originating from the east ~~for Fetch 3~~ as shown in Figure 2.4.3-209. CPNPP is protected from wind wave activity from the west and south by the local topography. Wave height, setup, and runup are estimated using USACE "Coastal Engineering Manual, EM 1110-2-1100" guidance (Reference 2.4-235). RCOL2_02.04.03-11

A two-year annual extreme mile wind speed of 50 mph was estimated based on ANSI/ANS-2.8-1992 as shown in Figure 2.4.3-210. The two-year annual extreme mile wind speed was adjusted for duration, based on the fetch length, level, over land or over water, and stability.The critical duration was found to be about 53 min. This corresponds to an adjusted wind speed of 49.91 mph.

Significant wave height (average height of the maximum 33-1/3 percent of waves) is estimated to be 2.76 ft, crest to trough. The maximum wave height (average height of the maximum 1 percent of waves) is estimated to be 4.59 ft., crest to trough. The corresponding wave period is 2.6 sec.

Slopes of 10:1 and 3:1, horizontal to vertical, in the vicinity of the CPNPP were used to determine the wave setup and runup. Additionally, wind wave activity at the vertical retaining wall was also examined. The runup includes wave setup. Runup for the 10:1 slopes was estimated to be 2.85 ft. Runup for the 3:1 slopes was estimated to be ~~6.98~~6.99 ft. Runup at the vertical retaining wall on the north side of CPNPP Units 3 and 4 was estimated to be 16.90 ft. RCOL2_02.04.03-11

Wind setup was estimated using additional USACE Hydrologic Engineering Requirements for Reservoirs, EM 1110-2-1420 guidance (Reference 2.4-236). The maximum wind setup was estimated to be ~~0.07~~0.08 ft. The maximum total wind wave activity is estimated to be ~~16.97~~16.98 ft and occurs at the vertical retaining wall. The PMF and maximum coincident wind wave activity results in a flood elevation of ~~807.87~~810.64 ft msl. Elevations are provided with reference to the National Geodetic Vertical Datum of 1929 (NGVD 29). The plant site elevation RCOL2_02.04.03-11 RCOL2_02.04.03-11 is referenced to the North American Vertical Datum of 1988 (NAVD 88). According to the National Geodetic Survey, the datum shift of NAVD 88 minus NGVD 29 is equal to between 0 and +0.66 in for the site. Therefore, it is conservative to account for a maximum conversion of +0.66 ft when comparing water surface elevations determined using NGVD 29 to elevations at the site in NAVD 88. Considering conversion, the coincident wind wave activity water surface elevation is 810.64 ft NAVD 88. The top elevation of the retaining wall is ~~805~~795 ft msl. Although the coincident wind wave activity water surface elevation exceeds the top elevation of the retaining wall, the water surface elevation is maximized by assuming a vertical surface continues above elevation 805 ft msl. The CPNPP Units 3 and 4 safety-related structures are located at elevation 822 ft msl and are unaffected by flood conditions and coincident wind wave activity. In the event of Squaw Creek Dam failure, the determined fetch length would not be increased. RCOL2_02.04.03-11

2.4.5 Probable Maximum Surge and Seiche Flooding

CP COL 2.4(1) Replace the contentAdd the following at the end of DCD Subsection 2.4.5 with the following. RCOL2_02.04-1

According to the NRC Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," probable maximum surge and seiche flooding is considered based on a probable maximum hurricane (PMH), probable maximum windstorm (PMWS), or moving squall line. (Reference 2.4-229) The region of occurrence for a PMH is along U.S. coastline areas. For a PMWS, the region of occurrence is along coastline areas and large bodies of water such as the Great Lakes. A moving squall is considered for the Great Lakes region.

According to USACE EM 1110-2-1100 (Reference 2.4-235) guidelines, meteorological wind systems generated by thunderstorms and frontal squall lines can generate waves up to 16.4 ft high for inland waters. Additionally, mesoscale convective complex wind systems affecting inland waters are fetch-limited and based on wind speeds of up to about 66 fps or 45 mph. Similar wind speeds are used to determine the coincident wind-generated wave activity discussed in Subsection 2.4.3. The coincident wind wave activity, including wave setup, results in maximum runup of 16.9 ft. The maximum wind setup is estimated to be 0.070.08 ft. Therefore, the total water surface elevation increase due to wind wave activity is estimated to be 16.9716.98 ft. The resulting PMF coincident with wind wave activity elevation is 807.87810.64 ft msl. RCOL2_02.04.03-11

The USACE guideline procedure for geologic hazard evaluations considers seiche waves greater than 7 ft to be rare. (Reference 2.4-242) The seiche hazard can be screened out for sites located more than 7 ft above the adjacent water body.

According to the guidance of ANSI/ANS-2.8-1992 (Reference 2.4-229), the region of occurrence for a PMH shall be considered for U.S. coastline areas and areas within 100 to 200 miles bordering the Gulf of Mexico. CPNPP Units 3 and 4 are located approximately 275 mi inland from the Gulf of Mexico and outside the region of occurrence for a PMH. Therefore, a PMH was not considered. CPNPP Units 3 and 4 safety-related facilities are located at the plant grade level elevation of 822 ft msl. A surge due to a PMH event would not cause flooding at the site. RCOL2_02.04.05-5

According to the guidance of ANSI/ANS-2.8-1992 (Reference 2.4-229), the region of occurrence for a PMWS should be considered for locations along the Pacific Coast and North Atlantic Coast of the U.S. and large bodies of water such as the Great Lakes. Likewise, the region of occurrence for a moving squall line should be considered for locations along Lake Michigan and the other Great Lakes. CPNPP Units 3 and 4 are located outside of the region of occurrence for a PMWS and a moving squall line. Therefore, a PMWS and a moving squall line have not been considered. RCOL2_02.04.05-5

2.4.7 Ice Effects

CP COL 2.4(1) ~~Replace the content~~Add the following at the end of DCD Subsection 2.4.7 ~~with the following~~. RCOL2_02.04-1

According to the EPA STOrage and RETrieval (STORET) database, two gaging stations located on the SCR and its tributaries recorded water temperatures for different periods between 1973 and 1985. The lowest recorded water temperatures range from 41.9°F to 50°F. The lowest recordings, 41.9°F, occurred on February 10, 1982 at station 11555, Squaw Creek and State Highway 144 (SH 144), Northeast of Glen Rose. (Reference 2.4-245)

Gaging station 11856 is located on Brazos River and gaging station 11976 is located on Paluxy River. The gaging station 11856 on Brazos River at U.S. Highway 67 (US 67) recorded water temperatures from 1968 to 1998. The lowest recorded water temperature at this station was 39.02°F. (Reference 2.4-245) The gaging station 11976 on Paluxy River in City Park recorded water temperatures from 1973 to 1996. The lowest recorded water temperature at this station was 39.2°F. (Reference 2.4-245) This data suggests that Squaw Creek water temperatures generally remain above the freezing point. The recordings are summarized in Table 2.4.7-201.

According to the USACE, ice jams occur in 36 states, primarily in the northern tier of the United States. (Reference 2.4-246) (Figure 2.4.7-201) Texas is not included in this coverage. USACE Cold Regions Research and Engineering Laboratory historical ice jam database (Reference 2.4-247) indicates no ice jams for Squaw Creek. However, the USACE ice jam database reports that Brazos River was obstructed by rough ice at Rainbow near Glen Rose, Texas, on January 22-23 and January 25-28, 1940, with flood stage of 20 ft. (Reference 2.4-247)

CPNPP Units 3 and 4 safety-related facilities are located at elevation 822 ft msl. The SCR spillway elevation is 775 ft msl (Reference 2.4-214). The maximum water surface elevation during a probable maximum flood event and coincident wind waves is at ~~790.9~~810.64 ft msl, which is more than ~~30~~11 ft below the CPNPP Units 3 and 4 safety-related facilities. The possibility of inundating CPNPP Units 3 and 4 safety-related facilities due to an ice jam is remote. RCOL2_02.04.07-2 RCOL2_02.04.03-11

Meteorological records from the Southern Regional Climate Center (SRCC) were examined for areas in the vicinity of CPNPP Units 3 and 4. Records indicate that December and January have the coldest temperatures. For the available period of record from 1971 to 2000, the climate station at Dallas/Fort Worth has a recorded monthly average minimum temperature of 34°F, occurring in January. (Reference 2.4-248)

According to the USACE, frazil ice forms in supercooled turbulent water in rivers and lakes. (Reference 2.4-246) Anchor ice is defined as frazil ice attached to the river bottom, irrespective of the nature of its formation. The potential for freezing (i.e., frazil or anchor ice) and subsequent ice jams on the Squaw Creek and

2.4-285 Texas Water Development Board, Volumetric Survey Report of Possum Kingdom Lake December 2004-January 2005 Survey, May 2006. RCOL2_02.04.04-5 and 7

2.4-286 Freese and Nichols, Inc., Brazos River Authority Morris Sheppard Dam Breach Analysis Report, September 2001.

2.4-287 Federal Energy Regulatory Commission, "Environmental and Public Use Inspection Report, Morris Sheppard (Possum Kingdom)", August 5, 1999.

2.4-288 U.S. Geological Survey, Water-Data Report 2008, 08088500 Possum Kingdom Lake near Graford, TX, Website, http://wdr.water.usgs.gov/, accessed May 2010.

2.4-289 Texas Water Development Board, Volumetric Survey Report of Lake Granbury July 2003 Survey, September 2005.

2.4-290 U.S. Geological Survey, Water-Data Report 2008, 08090900 Lake Granbury near Granbury, TX, Website, http://wdr.water.usgs.gov/, accessed May 2010.

2.4-291 National Geodetic Survey, Website, http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html, accessed May 2010. RCOL2_02.04.03-5

CP COL 2.4(1)

Table 2.4.3-203 (Sheet 1 of 3)
Squaw Creek Subbasin, Basin 2, Hourly CumulativeIncremental PMP Estimates

RCOL2_02.04.03-5

Time (hr)	Hourly CumulativeIncremental PMP (in) Basin 1	Basin 2	Basin 3	Basin 4
0100	0.10	0.10	0.09	0.10
0200	0.20	0.200.10	0.18	0.19
0300	0.30	0.300.10	0.27	0.29
0400	0.40	0.400.10	0.36	0.38
0500	0.50	0.500.10	0.46	0.48
0600	0.59	0.590.10	0.55	0.57
0700	0.71	0.710.11	0.66	0.69
0800	0.83	0.830.11	0.77	0.80
0900	0.95	0.950.11	0.88	0.92
1000	1.07	1.070.11	0.99	1.03
1100	1.19	1.190.11	1.10	1.15
1200	1.31	1.310.11	1.21	1.26
1300	1.47	1.470.12	1.35	1.41
1400	1.62	1.620.12	1.49	1.55
1500	1.77	1.770.12	1.63	1.70
1600	1.92	1.920.12	1.77	1.84
1700	2.07	2.070.12	1.91	1.99
1800	2.23	2.230.12	2.05	2.14
1900	2.43	2.430.13	2.24	2.34
2000	2.64	2.640.13	2.43	2.53
2100	2.85	2.850.15	2.62	2.73
2200	3.05	3.050.15	2.81	2.93
2300	3.26	3.260.15	3.00	3.13
2400	3.47	3.470.15	3.19	3.33
2500	3.76	3.760.15	3.46	3.61
2600	4.06	4.060.15	3.74	3.90
2700	4.37	4.380.21	4.03	4.20
2800	4.70	4.710.21	4.34	4.52
2900	5.06	5.060.21	4.66	4.86
3000	5.43	5.430.21	5.00	5.22
3100	6.06	6.030.21	5.54	5.79

CP COL 2.4(1)

RCOL2_02.04.03-5

Table 2.4.3-203 (Sheet 2 of 3)
Squaw Creek Subbasin, Basin 2, Hourly
~~Cumulative~~Incremental PMP Estimates

	Hourly ~~Cumulative~~Incremental PMP (in)			
Time (hr)	~~Basin 1~~	Basin 2	~~Basin 3~~	~~Basin 4~~
3200	~~6.75~~	~~6.69~~0.21	~~6.13~~	~~6.40~~
3300	~~7.52~~	~~7.42~~0.29	~~6.77~~	~~7.08~~
3400	~~8.40~~	~~8.23~~0.30	~~7.48~~	~~7.84~~
3500	~~9.39~~	~~9.15~~0.32	~~8.27~~	~~8.68~~
3600	~~10.53~~	~~10.18~~0.33	~~9.16~~	~~9.64~~
3700	~~12.16~~	~~11.60~~0.35	~~10.36~~	~~10.92~~
3800	~~14.68~~	~~13.72~~0.37	~~12.09~~	~~12.80~~
3900	~~18.39~~	~~16.82~~0.60	~~14.50~~	~~15.48~~
4000	~~26.17~~	~~23.23~~0.66	~~18.75~~	~~20.60~~
4100	~~29.38~~	~~25.90~~0.73	~~20.87~~	~~22.93~~
4200	~~31.62~~	~~27.79~~0.81	~~22.42~~	~~24.62~~
4300	~~32.19~~	~~28.35~~0.92	~~22.93~~	~~25.14~~
4400	~~32.71~~	~~28.86~~1.04	~~23.40~~	~~25.63~~
4500	~~33.19~~	~~29.32~~1.42	~~23.83~~	~~26.08~~
4600	~~33.63~~	~~29.76~~2.12	~~24.23~~	~~26.50~~
4700	~~34.05~~	~~30.17~~3.10	~~24.61~~	~~26.89~~
4800	~~34.44~~	~~30.56~~6.42	~~24.97~~	~~27.27~~
4900	~~34.69~~	~~30.81~~2.67	~~25.20~~	~~27.51~~
5000	~~34.95~~	~~31.06~~1.89	~~25.44~~	~~27.76~~
5100	~~35.20~~	~~31.32~~0.56	~~25.67~~	~~28.00~~
5200	~~35.45~~	~~31.57~~0.51	~~25.90~~	~~28.24~~
5300	~~35.70~~	~~31.82~~0.47	~~26.14~~	~~28.49~~
5400	~~35.96~~	~~32.08~~0.44	~~26.37~~	~~28.73~~
5500	~~36.13~~	~~32.25~~0.41	~~26.53~~	~~28.90~~
5600	~~36.31~~	~~32.43~~0.39	~~26.70~~	~~29.07~~
5700	~~36.48~~	~~32.60~~0.25	~~26.86~~	~~29.24~~
5800	~~36.66~~	~~32.78~~0.25	~~27.02~~	~~29.40~~
5900	~~36.83~~	~~32.95~~0.25	~~27.18~~	~~29.57~~
6000	~~37.01~~	~~33.13~~0.25	~~27.34~~	~~29.74~~
6100	~~37.14~~	~~33.26~~0.25	~~27.47~~	~~29.87~~
6200	~~37.28~~	~~33.39~~0.25	~~27.59~~	~~30.00~~
6300	~~37.41~~	~~33.53~~0.18	~~27.71~~	~~30.13~~

CP COL 2.4(1)

Table 2.4.3-203 (Sheet 3 of 3)
Squaw Creek Subbasin, Basin 2, Hourly CumulativeIncremental PMP Estimates

RCOL2_02.04.03-5

Time (hr)	Hourly CumulativeIncremental PMP (in)			
	Basin 1	Basin 2	Basin 3	Basin 4
6400	37.54	33.660.18	27.84	30.26
6500	37.68	33.800.18	27.96	30.39
6600	37.81	33.930.18	28.08	30.51
6700	37.92	34.040.18	28.18	30.62
6800	38.03	34.150.18	28.28	30.72
6900	38.14	34.250.13	28.38	30.83
7000	38.24	34.360.13	28.48	30.93
7100	38.35	34.470.13	28.58	31.03
7200	38.46	34.580.13	28.68	31.14

CP COL 2.4(1)

Table 2.4.3-205 (Sheet 1 of 3) Paluxy River Watershed Subbasin Hourly ~~Cumulative~~Incremental PMP Estimates

RCOL2_02.04.03-5

	Hourly ~~Cumulative~~Incremental PMP (in)			
Time (hr)	~~Basin 1~~	~~Basin 2~~	Basin 3	Basin 4
0100	~~0.10~~	~~0.10~~	0.10	0.10
0200	~~0.19~~	~~0.19~~	~~0.20~~0.10	~~0.20~~0.10
0300	~~0.29~~	~~0.29~~	~~0.30~~0.12	~~0.30~~0.12
0400	~~0.38~~	~~0.38~~	~~0.40~~0.12	~~0.40~~0.12
0500	~~0.48~~	~~0.48~~	~~0.51~~0.12	~~0.50~~0.12
0600	~~0.57~~	~~0.58~~	~~0.61~~0.12	~~0.60~~0.12
0700	~~0.69~~	~~0.69~~	~~0.73~~0.12	~~0.72~~0.12
0800	~~0.80~~	~~0.81~~	~~0.85~~0.12	~~0.84~~0.12
0900	~~0.92~~	~~0.92~~	~~0.98~~0.16	~~0.96~~0.15
1000	~~1.03~~	~~1.04~~	~~1.10~~0.16	~~1.08~~0.15
1100	~~1.15~~	~~1.16~~	~~1.22~~0.16	~~1.21~~0.15
1200	~~1.26~~	~~1.27~~	~~1.34~~0.16	~~1.33~~0.15
1300	~~1.41~~	~~1.42~~	~~1.50~~0.16	~~1.48~~0.15
1400	~~1.55~~	~~1.57~~	~~1.65~~0.16	~~1.63~~0.15
1500	~~1.70~~	~~1.71~~	~~1.81~~0.21	~~1.79~~0.21
1600	~~1.84~~	~~1.86~~	~~1.96~~0.21	~~1.94~~0.21
1700	~~1.99~~	~~2.01~~	~~2.12~~0.21	~~2.10~~0.21
1800	~~2.13~~	~~2.15~~	~~2.27~~0.21	~~2.25~~0.21
1900	~~2.33~~	~~2.36~~	~~2.49~~0.21	~~2.46~~0.21
2000	~~2.53~~	~~2.56~~	~~2.70~~0.21	~~2.67~~0.21
2100	~~2.72~~	~~2.76~~	~~2.91~~0.30	~~2.88~~0.29
2200	~~2.92~~	~~2.96~~	~~3.12~~0.31	~~3.09~~0.31
2300	~~3.12~~	~~3.16~~	~~3.33~~0.32	~~3.30~~0.32
2400	~~3.32~~	~~3.36~~	~~3.55~~0.34	~~3.51~~0.34
2500	~~3.60~~	~~3.64~~	~~3.84~~0.36	~~3.80~~0.35
2600	~~3.89~~	~~3.93~~	~~4.15~~0.38	~~4.11~~0.38
2700	~~4.19~~	~~4.24~~	~~4.47~~0.60	~~4.43~~0.60
2800	~~4.50~~	~~4.56~~	~~4.81~~0.65	~~4.76~~0.65
2900	~~4.84~~	~~4.90~~	~~5.17~~0.71	~~5.12~~0.72
3000	~~5.19~~	~~5.26~~	~~5.55~~0.79	~~5.49~~0.80
3100	~~5.75~~	~~5.82~~	~~6.15~~0.89	~~6.09~~0.91

CP COL 2.4(1)

Table 2.4.3-205 (Sheet 2 of 3)
Paluxy River Watershed Subbasin Hourly
~~Cumulative~~Incremental PMP Estimates

RCOL2_02.04.03-5

	Hourly ~~Cumulative~~Incremental PMP (in)			
Time (hr)	~~Basin 1~~	~~Basin 2~~	Basin 3	Basin 4
3200	~~6.34~~	~~6.41~~	~~6.79~~1.00	~~6.74~~1.03
3300	~~6.98~~	~~7.07~~	~~7.50~~1.34	~~7.46~~1.43
3400	~~7.70~~	~~7.79~~	~~8.29~~1.99	~~8.27~~2.16
3500	~~8.52~~	~~8.61~~	~~9.18~~3.01	~~9.18~~3.25
3600	~~9.44~~	~~9.54~~	~~10.17~~6.85	~~10.21~~7.27
3700	~~10.71~~	~~10.81~~	~~11.52~~2.54	~~11.63~~2.76
3800	~~12.60~~	~~12.69~~	~~13.51~~1.77	~~13.79~~1.92
3900	~~15.31~~	~~15.39~~	~~16.51~~0.56	~~17.04~~0.56
4000	~~20.47~~	~~20.56~~	~~23.37~~0.51	~~24.31~~0.51
4100	~~22.82~~	~~22.90~~	~~25.90~~0.47	~~27.07~~0.47
4200	~~24.51~~	~~24.58~~	~~27.67~~0.44	~~28.99~~0.44
4300	~~25.03~~	~~25.11~~	~~28.23~~0.42	~~29.54~~0.41
4400	~~25.51~~	~~25.59~~	~~28.74~~0.40	~~30.06~~0.39
4500	~~25.95~~	~~26.04~~	~~29.21~~0.26	~~30.53~~0.26
4600	~~26.37~~	~~26.46~~	~~29.66~~0.26	~~30.97~~0.26
4700	~~26.76~~	~~26.86~~	~~30.07~~0.26	~~31.38~~0.26
4800	~~27.13~~	~~27.24~~	~~30.47~~0.26	~~31.77~~0.26
4900	~~27.37~~	~~27.48~~	~~30.73~~0.26	~~32.03~~0.26
5000	~~27.61~~	~~27.73~~	~~30.99~~0.26	~~32.28~~0.26
5100	~~27.86~~	~~27.97~~	~~31.24~~0.18	~~32.54~~0.18
5200	~~28.10~~	~~28.22~~	~~31.50~~0.18	~~32.80~~0.18
5300	~~28.34~~	~~28.46~~	~~31.76~~0.18	~~33.05~~0.18
5400	~~28.58~~	~~28.71~~	~~32.02~~0.18	~~33.31~~0.18
5500	~~28.75~~	~~28.88~~	~~32.20~~0.18	~~33.49~~0.18
5600	~~28.92~~	~~29.05~~	~~32.38~~0.18	~~33.66~~0.18
5700	~~29.09~~	~~29.22~~	~~32.56~~0.14	~~33.84~~0.14
5800	~~29.25~~	~~29.39~~	~~32.74~~0.14	~~34.02~~0.14
5900	~~29.42~~	~~29.56~~	~~32.92~~0.14	~~34.19~~0.14
6000	~~29.59~~	~~29.73~~	~~33.10~~0.14	~~34.37~~0.14
6100	~~29.72~~	~~29.86~~	~~33.23~~0.14	~~34.51~~0.14
6200	~~29.85~~	~~29.99~~	~~33.37~~0.14	~~34.64~~0.14

CP COL 2.4(1)

Table 2.4.3-205 (Sheet 3 of 3) Paluxy River Watershed Subbasin Hourly ~~Cumulative~~Incremental PMP Estimates

RCOL2_02.04.03-5

	Hourly ~~Cumulative~~Incremental PMP (in)			
Time (hr)	~~Basin 1~~	~~Basin 2~~	Basin 3	Basin 4
6300	~~29.97~~	~~30.12~~	~~33.51~~0.11	~~34.78~~0.11
6400	~~30.10~~	~~30.25~~	~~33.64~~0.11	~~34.91~~0.11
6500	~~30.23~~	~~30.38~~	~~33.78~~0.11	~~35.05~~0.11
6600	~~30.36~~	~~30.51~~	~~33.92~~0.11	~~35.19~~0.11
6700	~~30.46~~	~~30.61~~	~~34.03~~0.11	~~35.30~~0.11
6800	~~30.57~~	~~30.72~~	~~34.14~~0.11	~~35.41~~0.11
6900	~~30.67~~	~~30.82~~	~~34.25~~0.10	~~35.52~~0.10
7000	~~30.77~~	~~30.93~~	~~34.36~~0.10	~~35.63~~0.10
7100	~~30.88~~	~~31.03~~	~~34.47~~0.10	~~35.74~~0.10
7200	~~30.98~~	~~31.14~~	~~34.58~~0.10	~~35.85~~0.10

CP COL 2.4(1)

Table 2.4.3-206
Paluxy River Watershed Recorded Precipitation LossesNot Used

RCOL2_02.04.03-5

Date of Flood	Rainfall (in)	Duration (hr)	Losses (in)			Steady Loss (in/hr)
			Initial (1st 3 hrs)	Balance	Total	
05/23/52	4.19	15	0.85	2.24	3.09	0.187
04/06/57	2.94	12	0.47	1.36	1.83	0.151

Reference 2.4-206

CP COL 2.4(1)

Table 2.4.3-207
Watershed Subbasin Characteristics

RCOL2_02.04.03-5

Basin	Area (sq mi)	Baseflow (cfs)	L (mi)	Lca (mi)	C_t	C_p	Lag Time (hr)
Basin 1a & 1c	44.9 43.9	8.86 42.01	13.7	6.5	1.1 0.4	0.76 0.8	1.91
Basin 1b	20.3	8.86 42.01	5.3	2.5	0.6 0.4	0.64 0.8	1.08
Basin 2	10.65	1.47 6.97	4.6	3.0	0.6 0.4	0.64 0.8	1.09
Basin 3	24.3	3.35 15.90	4.9	5.3 5.6	0.6 0.4	0.77 0.8	1.35
Basin 4	410.0	56.57 268.28	59.3	29.8 25.8	0.6 0.4	0.80 0.8	4.51

L = length of the main stream from outlet to basin divide

L_{ca} = length along the main stream from the outlet to a point nearest the watershed centroid

C_t & C_p values resulting in higher water surface elevation at the CPNPP Units 3 and 4 were used.

Table 2.4.3-208

Squaw Creek Reservoir Watershed, Basin 1, 6-hr Incremental PMP Estimates

RCOL2_02.04.03-5

Duration (hr)	Incremental PMP (in)
6	0.61
12	0.74
18	0.94
24	1.28
30	2.02
36	5.01
42	24.93
48	2.87
54	1.57
60	1.08
66	0.82
72	0.67
Total	42.53

Note:

Values derived from HMR 51, HMR 52, and the use of HMR 52 computer software. The critical storm was determined to be 100 sq mi with a 181 degree storm orientation, centered near the centroid of the Squaw Creek watershed.

Table 2.4.3-209

Squaw Creek Reservoir Sub-basin, Basin 1, Hourly Incremental PMP Estimates

RCOL2_02.04.03-5

Time (hr)	Incremental PMP (in)	Time (hr)	Incremental PMP (in)
0100	0.10	3700	0.36
0200	0.10	3800	0.38
0300	0.10	3900	0.63
0400	0.10	4000	0.69
0500	0.10	4100	0.76
0600	0.10	4200	0.86
0700	0.11	4300	0.97
0800	0.11	4400	1.10
0900	0.11	4500	1.51
1000	0.11	4600	2.33
1100	0.11	4700	3.84
1200	0.11	4800	12.11
1300	0.12	4900	3.12
1400	0.12	5000	2.03
1500	0.12	5100	0.58
1600	0.12	5200	0.53
1700	0.12	5300	0.49
1800	0.12	5400	0.45
1900	0.14	5500	0.42
2000	0.14	5600	0.40
2100	0.16	5700	0.26
2200	0.16	5800	0.26
2300	0.16	5900	0.26
2400	0.16	6000	0.26
2500	0.16	6100	0.26
2600	0.16	6200	0.26
2700	0.21	6300	0.18
2800	0.21	6400	0.18
2900	0.21	6500	0.18
3000	0.21	6600	0.18
3100	0.21	6700	0.18
3200	0.21	6800	0.18
3300	0.30	6900	0.14
3400	0.31	7000	0.14
3500	0.33	7100	0.14
3600	0.34	7200	0.14

Table 2.4.3-210

Snyder's Unit Hydrograph Characteristics

RCOL2_02.04.03-5

	Tp (hr)	Tb (hr)	Qp (cfs)	W75 (hr)	W50 (hr)	Q75 (cfs)	Q50 (cfs)	Nonlinear Qp +20%
Basin 1a & 1c	1.54	4.61	14,615	0.83	1.45	10,961	7308	17,538
Basin 1b	0.87	2.61	11,969	0.45	0.78	8977	5985	14,363
Basin 2	0.88	2.64	6203	0.45	0.79	4653	3102	7444
Basin 3	1.08	3.24	11,516	0.57	0.99	8367	5758	13,820
Basin 4	3.61	9.23	58,156	2.09	3.65	43,617	29,078	69,788

Tp = basin lag (hr); $C_t (LL_{ca})^{0.3}$

where

C_t = lag time coefficient

L = length of the main stream from the outlet to divide (mi)

L_{ca} = length along the main stream to a point nearest the watershed centroid (mi)

Tb = time base of the unit hydrograph (hr); 3+Tp/8 or 3 to 5 times Tp for small watersheds

Qp = peak discharge of the unit hydrograph (cfs); $640C_p$ A/Tp

where

C_p = peaking coefficient

A = drainage area (sq mi)

W75 = unit hydrograph width at 75 percent; $440(Qp/A)^{-1.08}$

W50 = unit hydrograph width at 50 percent; $770(Qp/A)^{-1.08}$

Q75 = unit hydrograph discharge at W75

Q50 = unit hydrograph discharge at W50

RCOL2_02.04.03-5

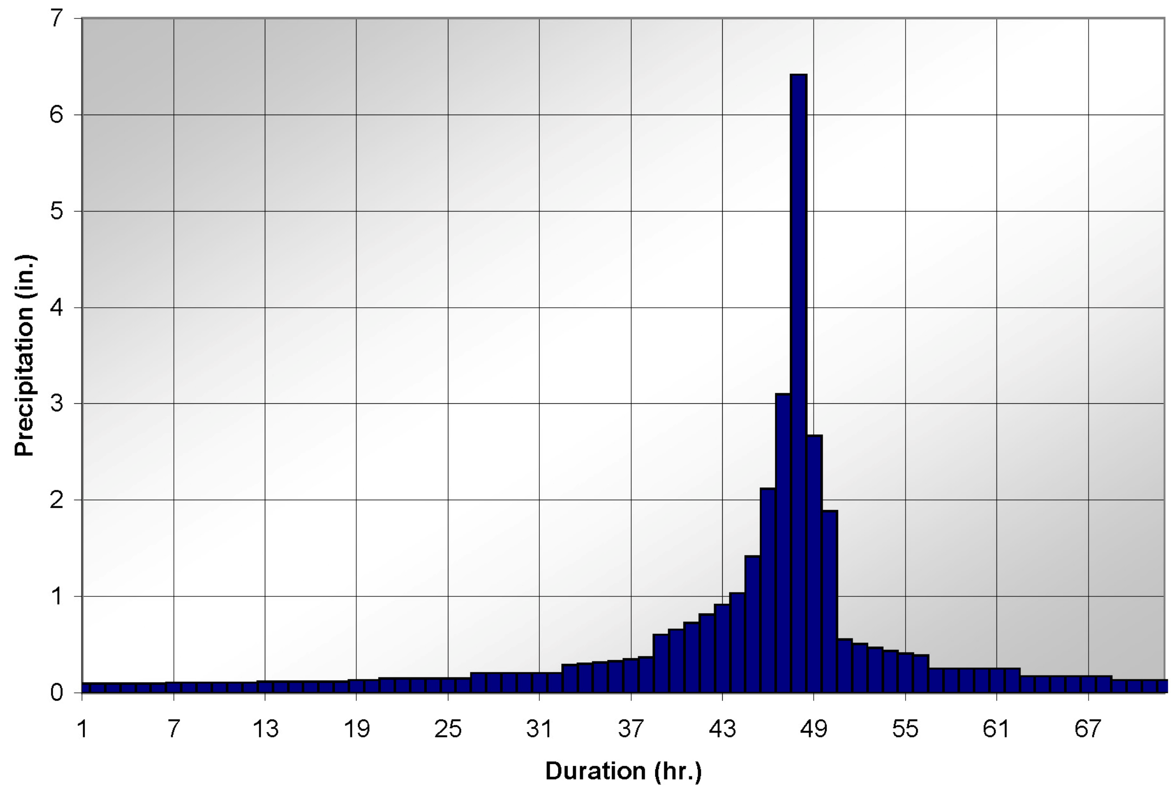

Figure 2.4.3-203 Squaw Creek Probable Maximum Precipitation Hyetograph

RCOL2_02.04.03-5

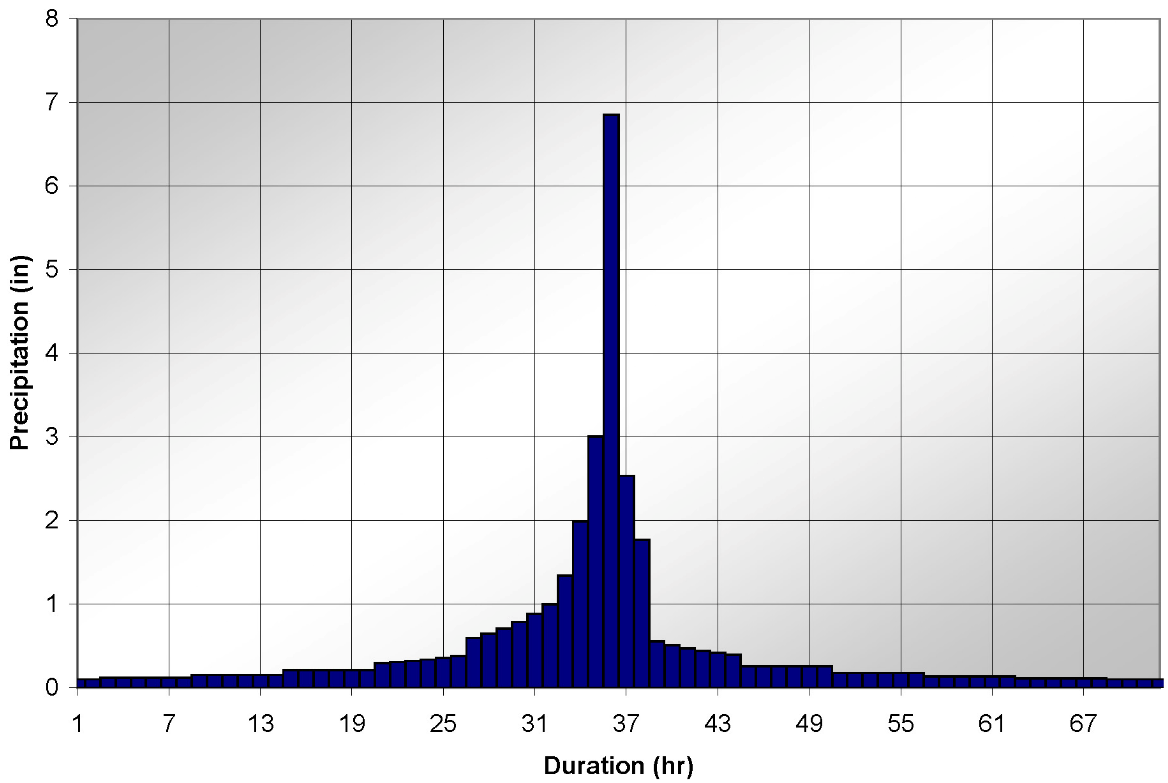

Figure 2.4.3-204 Paluxy River Probable Maximum Precipitation Hyetograph

RCOL2_02.0
4.03-5

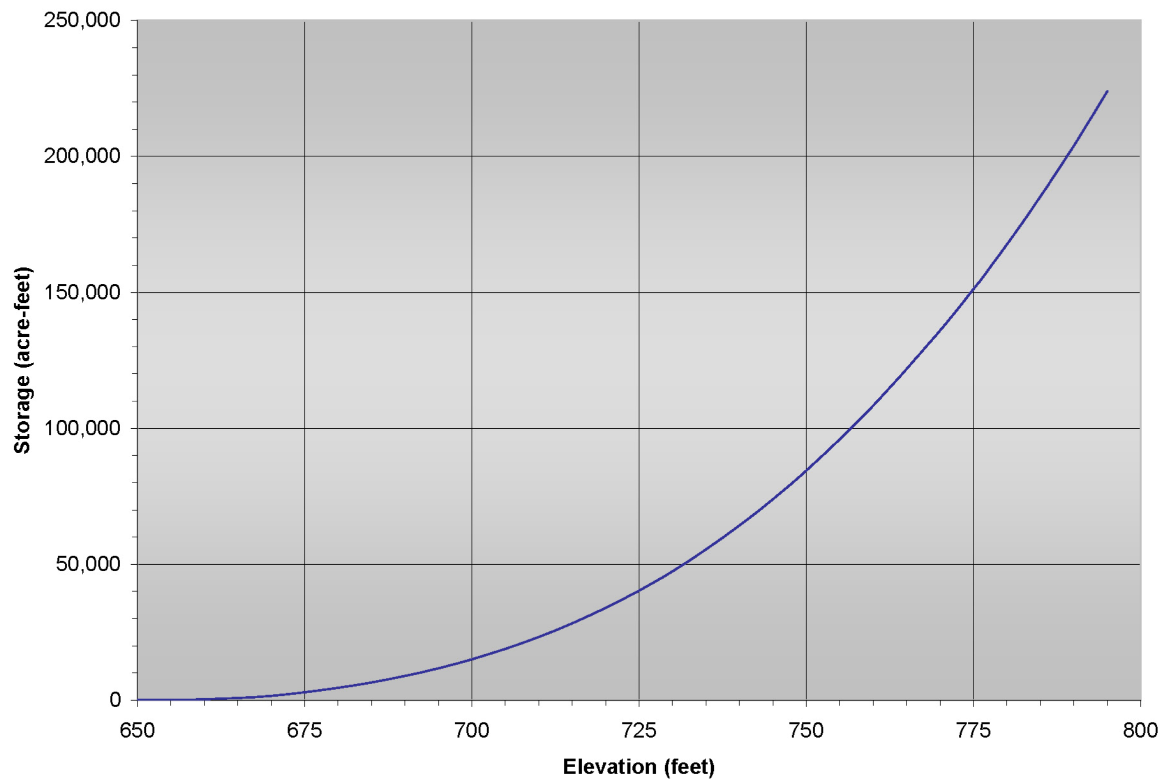

Figure 2.4.3-206 SCR Storage Elevation Discharge Rating Curve

RCOL2_02.04.03-5

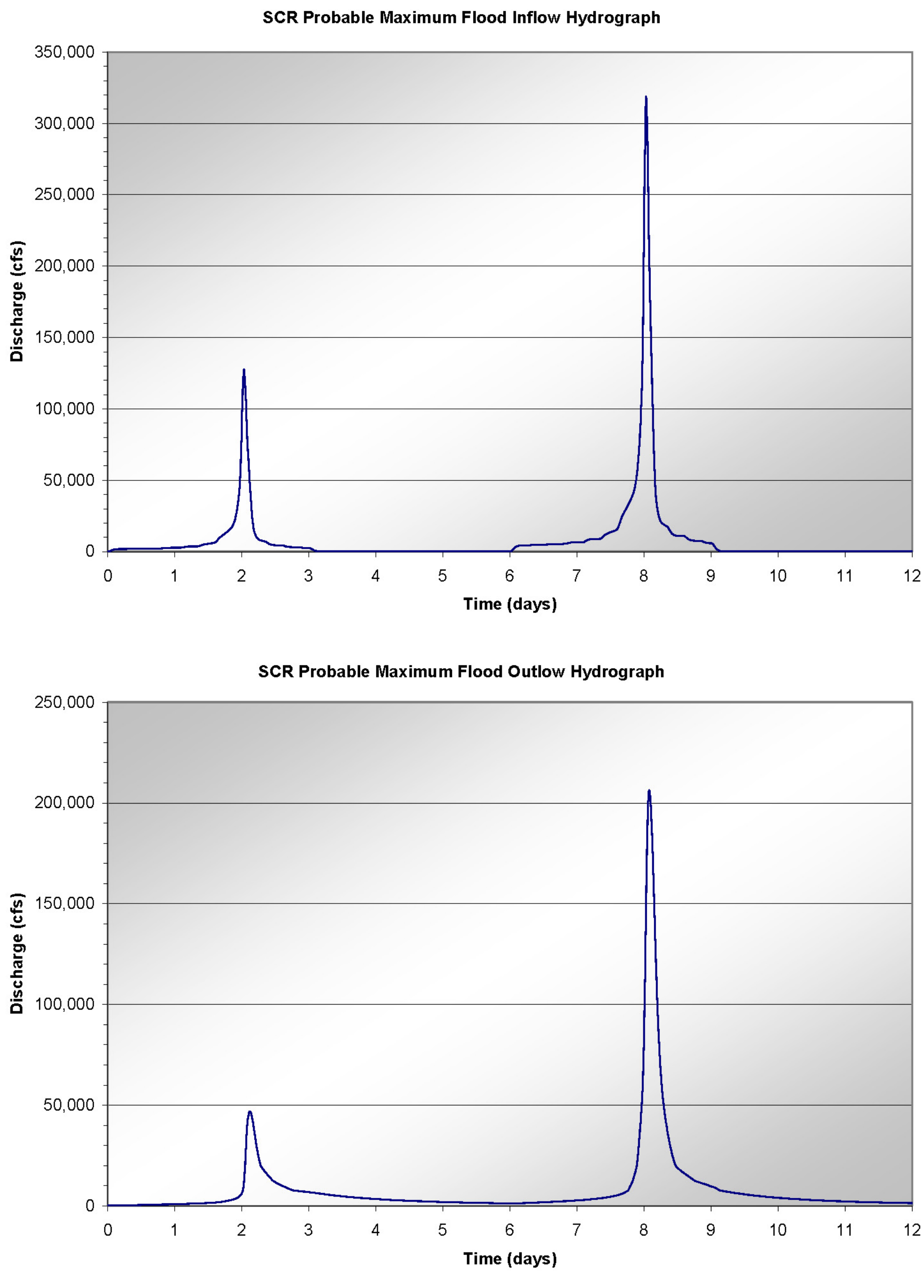

Figure 2.4.3-207 SCR Probable Maximum Flood Inflow Outflow Hydrographs

RCOL2_02.04.03-5

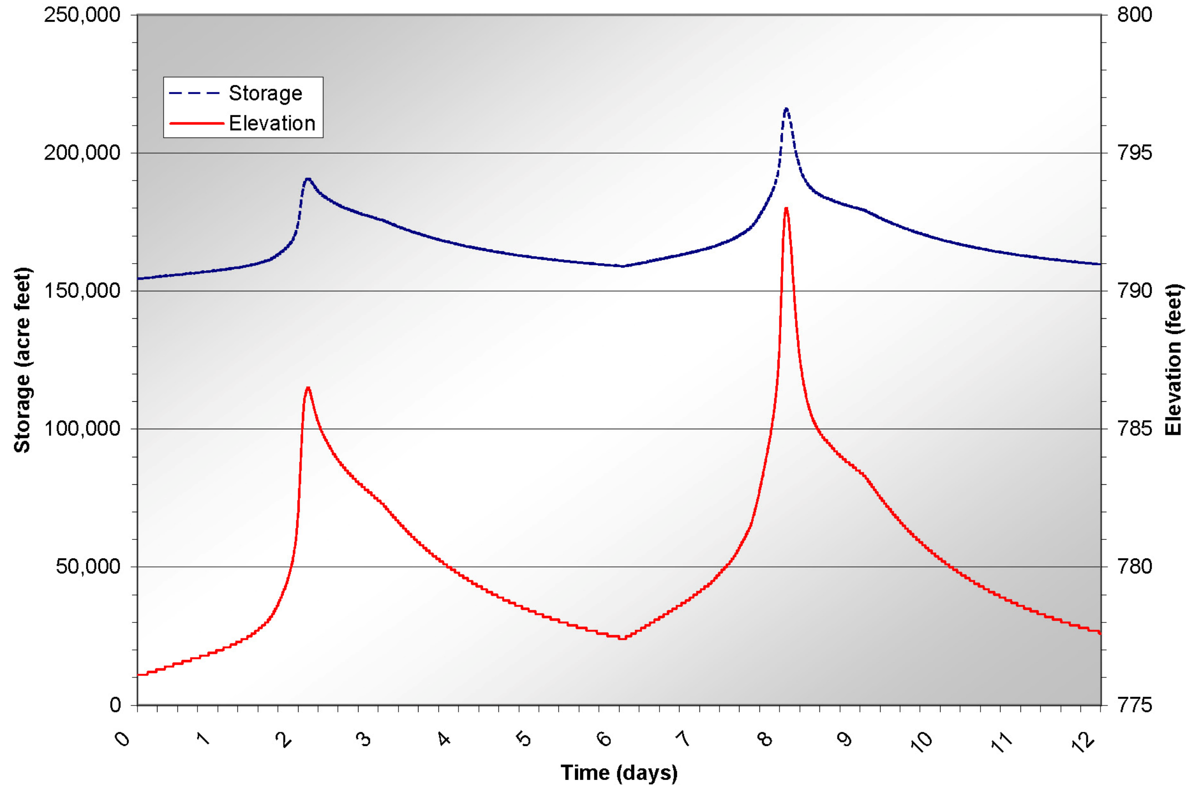

Figure 2.4.3-208 SCR Probable Maximum Flood Elevation Outflow Hydrograph

RCOL2_02.04.03-11

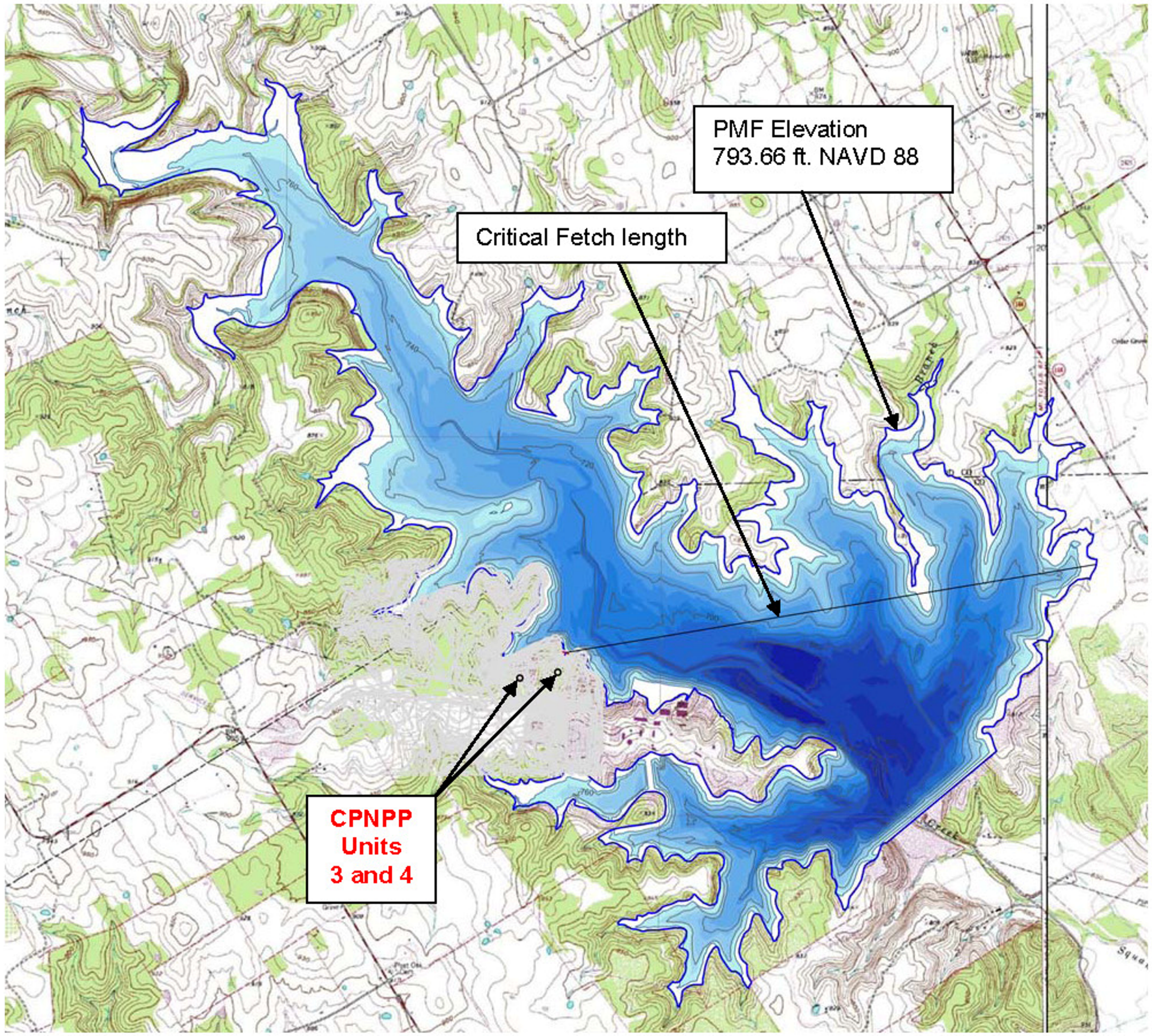

Figure 2.4.3-209 Coincident Wind Wave Activity Fetch Length

RCOL2_02.04.03-5

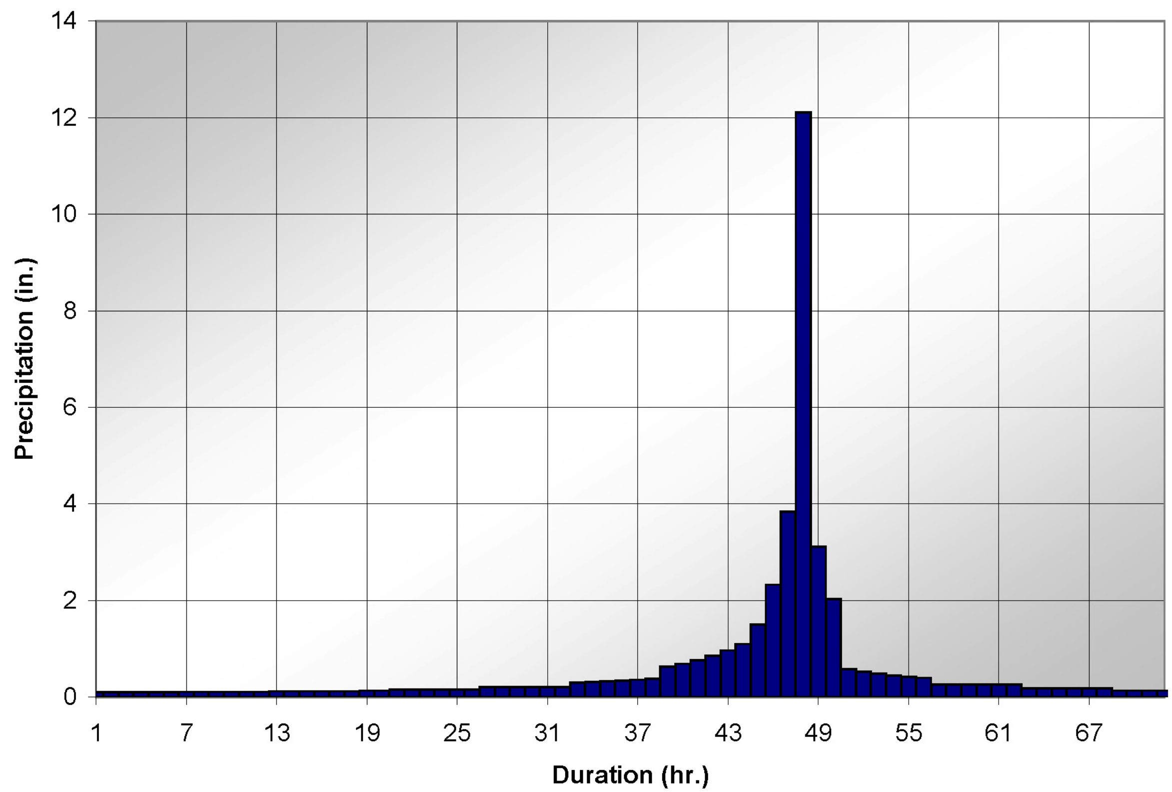

Figure 2.4.3-211 Squaw Creek Reservoir Basin 1 Probable Maximum Precipitation Hyetograph

RCOL2_02.04.03-5

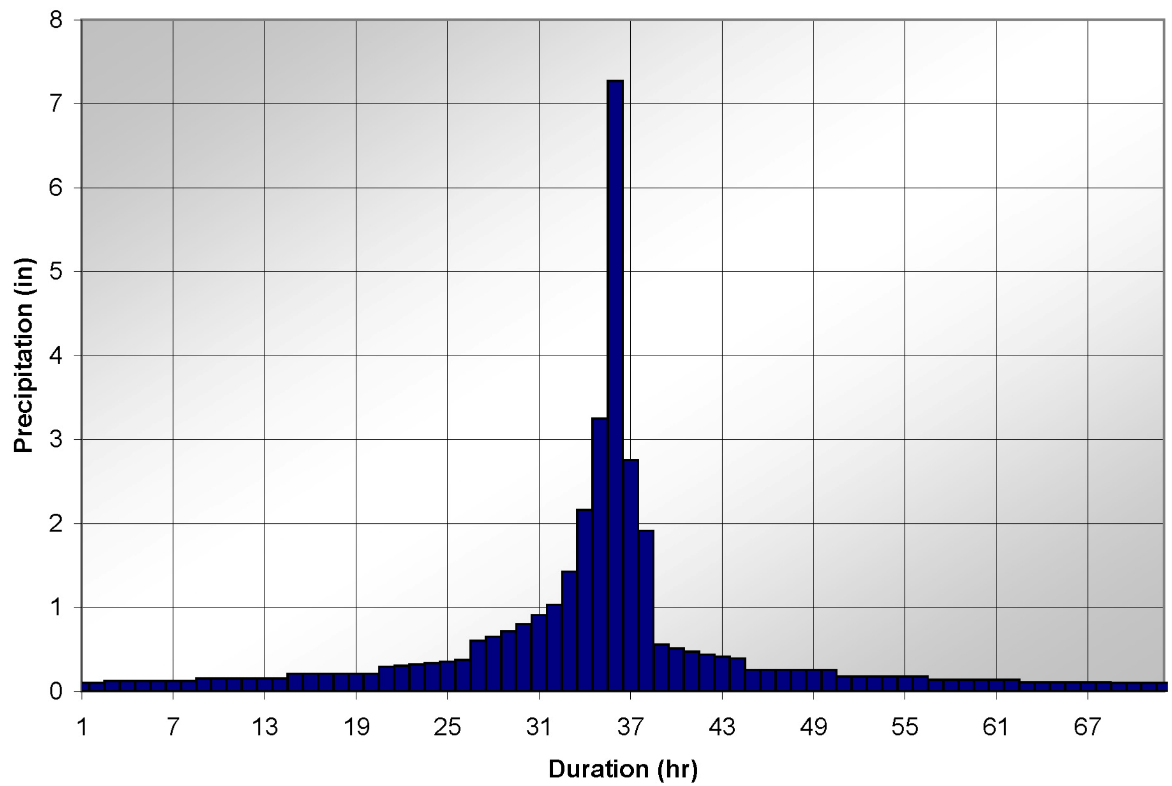

Figure 2.4.3-212 Paluxy River Basin 4 Probable Maximum Precipitation Hyetograph

RCOL2_02.04.03-5

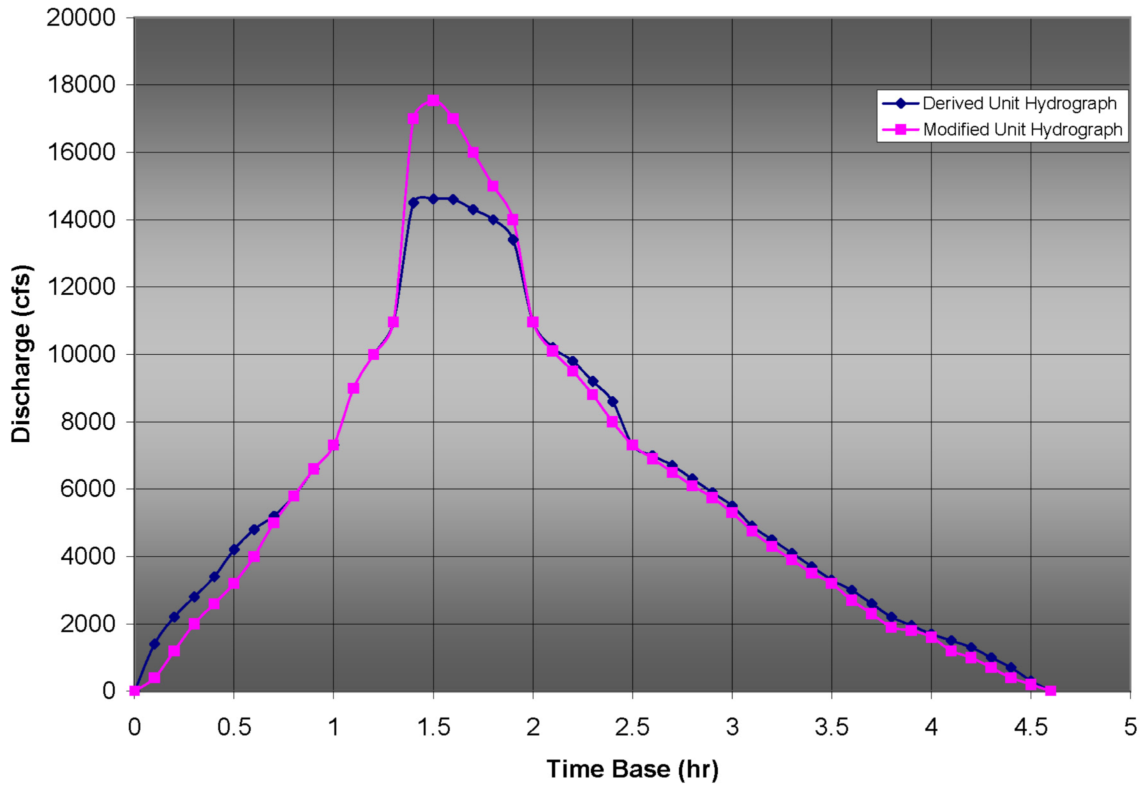

Figure 2.4.3-213 Snyder's Unit Hydrograph Basins 1a and 1c

RCOL2_02.04.03-5

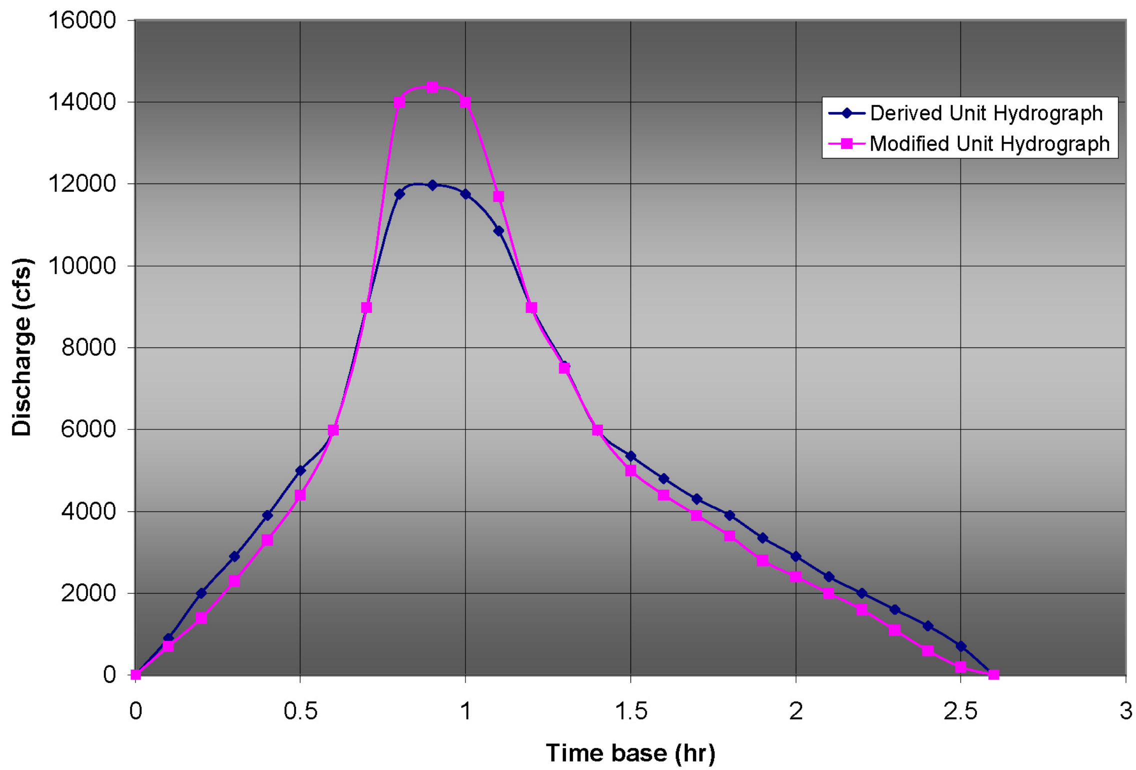

Figure 2.4.3-214 Snyder's Unit Hydrograph Basin 1b

RCOL2_02.0
4.03-5

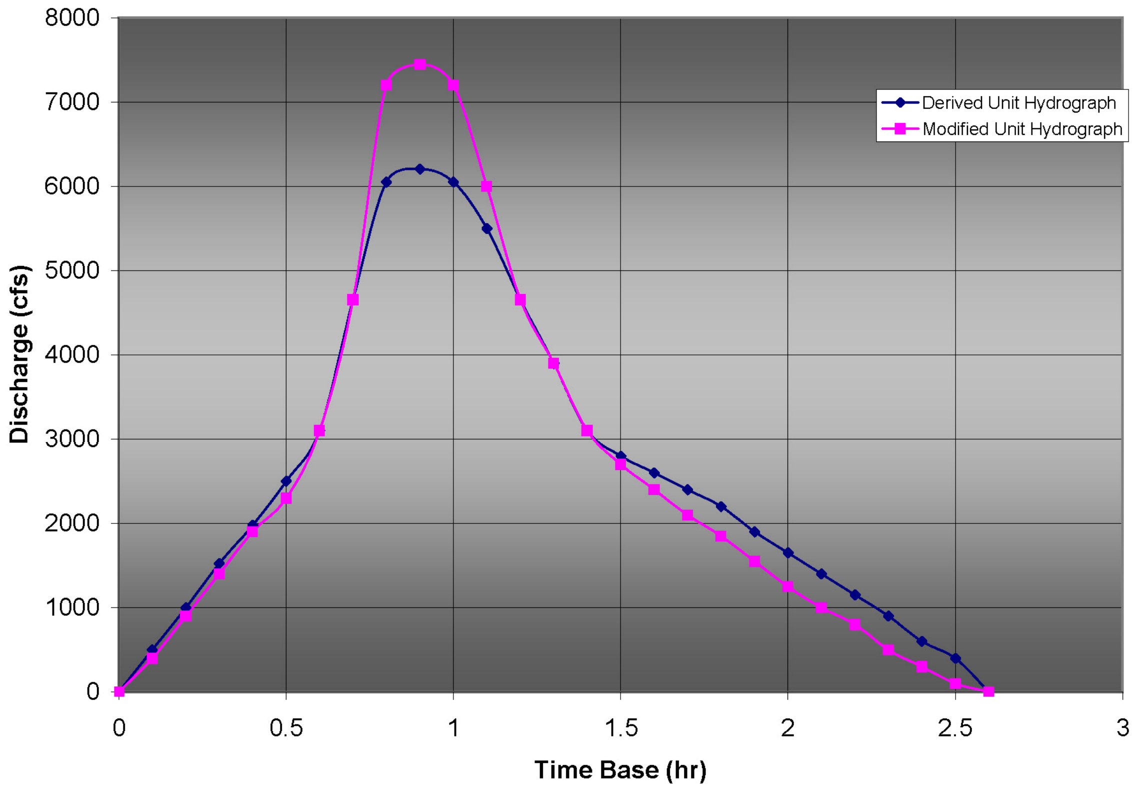

Figure 2.4.3-215 Snyder's Unit Hydrograph Basin 2

RCOL2_02.04.03-5

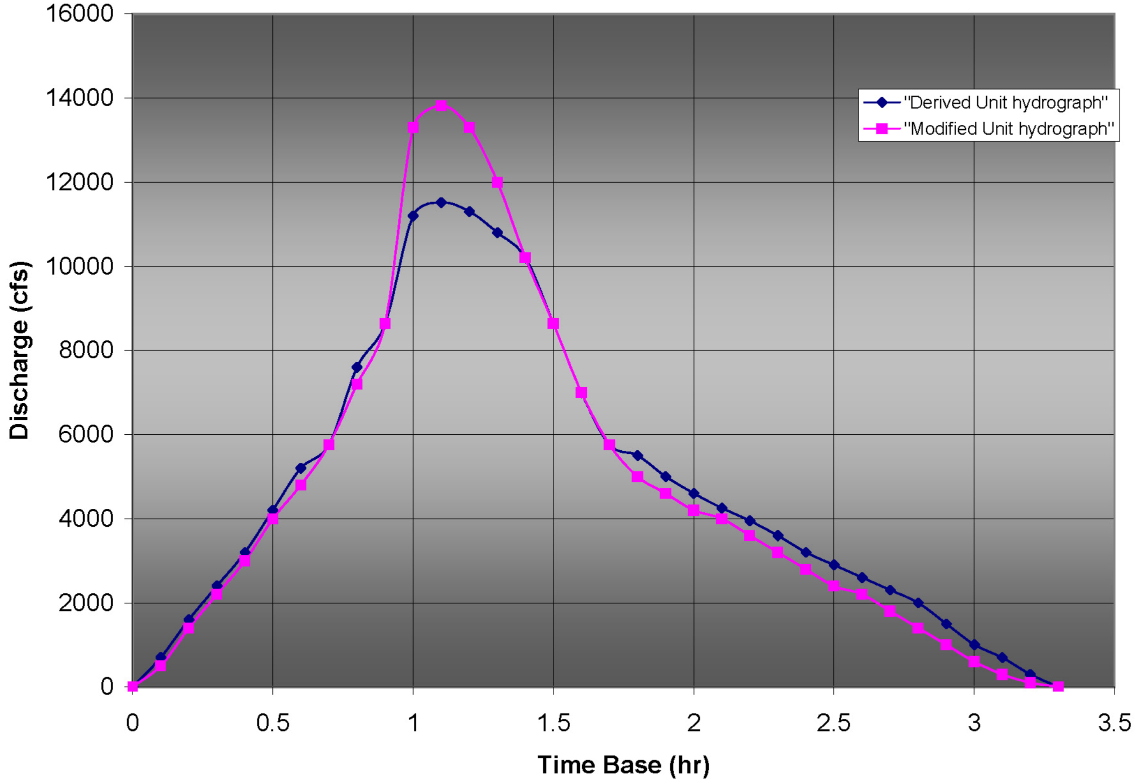

Figure 2.4.3-216 Snyder's Unit Hydrograph Basin 3

RCOL2_02.04.03-5

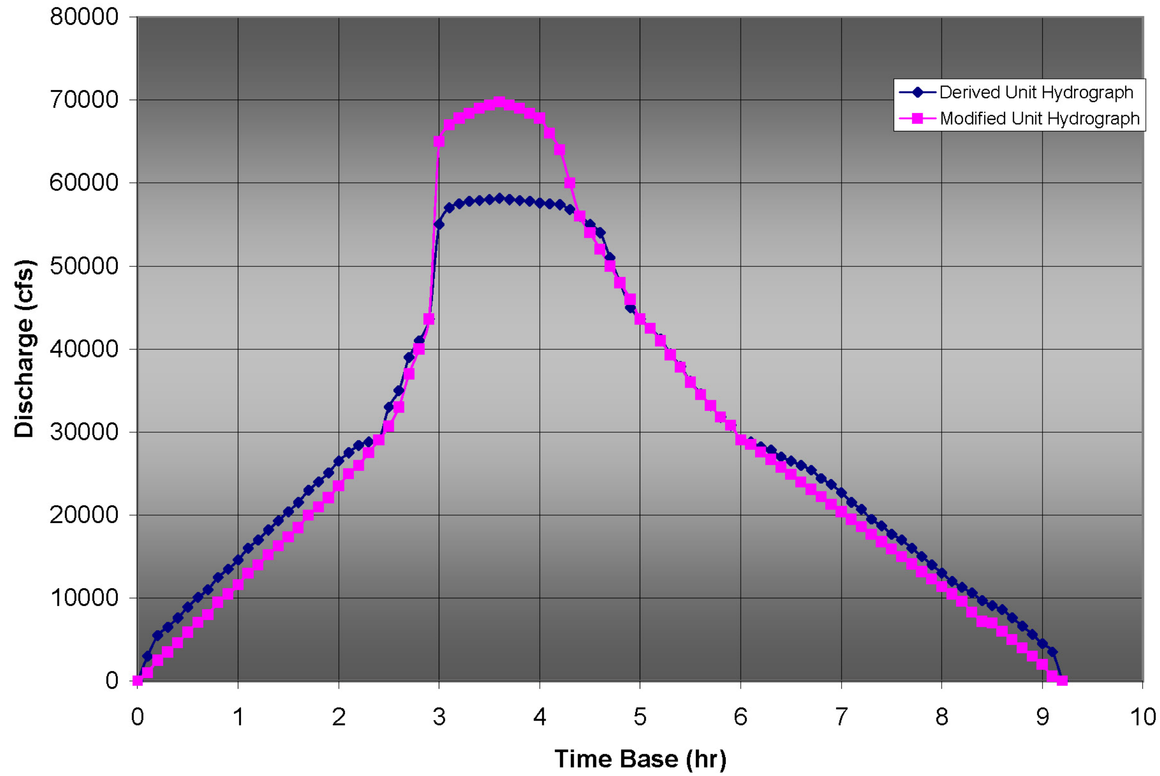

Figure 2.4.3-217 Snyder's Unit Hydrograph Basin 4

RCOL2_02.0
4.03-5

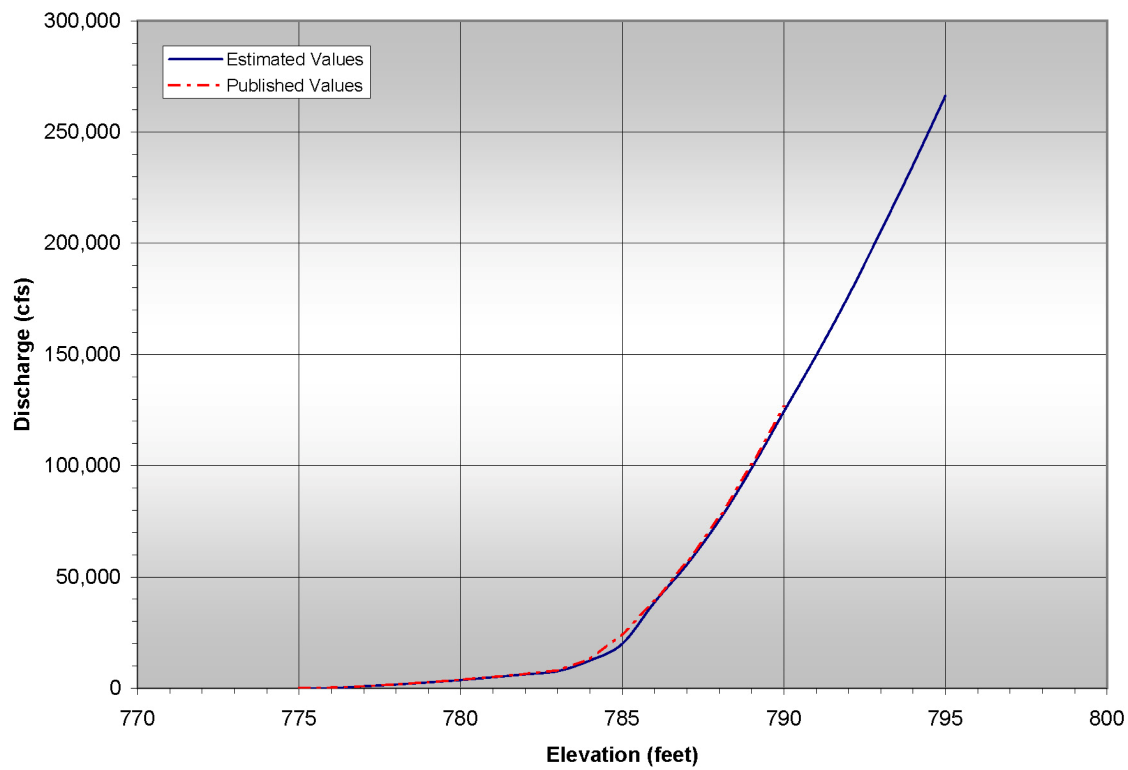

Figure 2.4.3-218 Discharge-Elevation Rating Curve