DRY CANYON CREEK RESTORATION PROJECT
GRANT SUPPORT
HEADWATER CORNERS FLOODPLAIN ANALYSIS

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February 12, 2003

1. INTRODUCTION

This summary report presents the results of a preliminary hydrologic floodplain analysis conducted for the Mountains Restoration Trust (MRT) in support of a grant application to the Department of Water Resources for the restoration of the Headwater Corners site (study area) on the southern bank of Dry Canyon Creek near the intersection of Topanga Canyon Road and Mulholland Highway in the City of Calabasas. The objective of the study is to establish whether or not the area is within the 100-year flood boundary based on existing site conditions. The information will provide a basis for a grant suitability determination by the Department of Water Resources.

2. CREEK CONDITIONS

The reach of the Creek between Palm Drive and Mulholland Highway was visually surveyed to provide information on the channel cross sectional characteristics and surface conditions for use in the floodplain analysis for the study area. The visual survey started just south of the properties at Palm Drive, proceeded upstream, and terminated at the crossing of Mulholland Highway.

The Creek flows into a concrete box culvert at 3871 Topanga Canyon Road south of Palm Drive. The culvert is approximately 10~12 feet wide and 6~7 feet tall with a metal grid gate at the inlet. The top of the culvert is approximately 5 feet below the street level. The inlet was relatively clear at the time of survey. The length of the culvert could not be determined at the time of survey due to restricted access downstream of its location. The culvert is shown in Photograph 1.

The Creek upstream of the box culvert consists typically of natural channel sections with variable depths of approximately 5~9 feet, bottom widths of approximately 5~10 feet and slopes of approximately 1:3 on average. A steel bridge crosses the Creek just upstream of the culvert. The bridge has a lowcord of approximately 10~12 feet from the bottom of the channel, a width of approximately 17 feet, and a span of approximately 60 feet. The channel under the steel bridge is shown in Photograph 2. The stream bed and banks are lined with cobbles, scattered boulders, tree stumps, exposed roots, thick layers of dead tree leaves and branches, and medium to dense leafless brushes. Trees and brushes at many locations have grown over the channel with dense groups of branches encroaching into the flow areas of the channel. The overgrown trees and brushes are shown in Photograph 3.

Photograph 1 Box Culvert under Properties South of Palm Drive

Photograph 2 Channel under Steel Bridge Upstream of Box Culvert

Photograph 3 Overgrown Trees and Brushes in Channel

A wooden bridge crosses the Creek at 3815 Topanga Canyon Road (former Bartelles property) at the intersection of Topanga Canyon Road and Mulholland Highway. The bridge has a lowcord of approximately 7~9 feet from the bottom of the channel, a width of approximately 14 feet, and a span of approximately 13 feet. The wooden bridge is shown in Photograph 4.

The Creek upstream of the wooden bridge typically consists of natural channel sections with steep side slopes of approximately 1:1~1:2 on average and narrow bottom widths. The stream bed and banks are lined with cobbles, scattered boulders, tree stumps, exposed roots, thick layers of dead tree leaves and branches, and medium to dense brushes. A typical channel section along this stretch of the Creek is shown in Photograph 5.

A corrugated metal circular culvert exists under an access road crossing the Creek at the boundary between the Bartelles property and the Miller property at 23075 Mulholland Highway near Dry Canyon Creek Park. The culvert measures approximately 25 feet in length and 6 feet in diameter with its top approximately 1 foot below the top of the road. The culvert is overall corroded and damaged at the inlet and outlet. The culvert is shown in Photograph 6.

There are a number of storm drains alongside this stretch of the Creek that drain storm water from the streets and hillsides south of Mulholland Highway. These include culverts under Mulholland Highway just upstream of the wooden bridge and at 23075 Mulholland Highway.

The Creek upstream of the Miller property receives flows from the headwater of the watershed through a circular culvert that crosses under Mulholland Highway just west of 23151 Mulholland Highway near Old Topanga Canyon Road.

3. HISTORICAL FLOODS

The study area was flooded historically during high-flow runoff events. One of the most significant events occurred in February, 1980, when the Bartelles property sustained significant flooding and resultant damages. The flows in the Creek during the storm exceeded the capacity of the corrugated metal culvert at the Miller-Bartelles property line, flowed over the road and the northern floodplain, and flooded the down-grade Bartelles property. Photograph 7 shows the flooding inside the Bartelles house (Bartelles, 1980). During the event, the Miller house on the southern bank of the Creek was not flooded. The flood water, however, came within a few feet of the house.

In addition to historical flooding of the floodplain, the Creek channel also sustained significant down-cutting during high-flow runoff events. The down-cutting near the wooden bridge was observed to be as much as 4 feet during the 1980 flood based on local accounts.

Photograph 4 Wooden Bridge at Bartelles Property

Photograph 5 Channel Upstream of Wooden Bridge

Photograph 6 Corrugated Metal Culvert at Miller-Bartelles Property Line

Photograph 7 Flooding inside Bartelles House

4. FLOODPLAIN ANALYSIS

The flood conditions in the study area were analyzed in a preliminary manner following standard FEMA procedures (FEMA, 1995). Since detailed channel cross-section survey data are not available for the reach of the Creek traversing the study area, information obtained from the broad visual survey presented previously was used as the basis for the analysis to provide preliminary estimate of the 100-year flood boundary in the study area.

4.1 Topography

A topographic map of the study area based on aerial photography dated 1989 was used for the analysis. The map consists of 2-feet elevation contour lines, vegetation area outlines, and property outlines. The resolution of the map is sufficient for defining the floodplains and the channel invert profile. The cross-sectional characteristics of the channel, however, were estimated based on the information from the field survey presented previously.

4.2 Hydrology

The hydrology of the study area was evaluated using the USGS NFF model (USGS, 2002). The model provides estimates of flood magnitudes and frequencies for ungaged watersheds based on regional data.

The watershed area above the study area is approximately 3 square miles. Average annual rainfall in the Santa Monica Mountains is approximately 20 inches (LACDPW, 2002). Average annual rainfall in Malibu Creek Watershed ranges from approximately 24 inches in the coastal area to approximately 14 inches in the upper watershed (PCR, 2001). An annual rainfall of 14 inches was considered appropriate for the study area given its relative proximity to the upper Malibu Creek Watershed. The land uses within the watershed above the study area is predominantly rangeland with minimal, scattered urban lands.

Table 1 presents the return-period peak flow discharges computed by the NFF model for the study area.

Table 1 Peak Flow Discharges

Return Period (year)	Discharge (cubic feet/second)
2	22
5	81
10	152
25	318
50	487
100	675

The results show that the 100-year peak flow discharge is approximately 675 cubic feet/second (cfs) from the watershed above the study area. Additional inflows from storm drains distributed within the study reach were approximately accounted for by adding half of the total incremental discharge between Mulholland Highway/Old Topanga Canyon Road intersection and Palm Drive to the 100-year flow based on design discharge calculations provided by Los Angeles County Department of Public Works (LACDPW, 1992). This gives a 100-year flow of approximately 1,340 cfs through the study reach.

4.3 Hydraulics

The hydraulics of the 100-year peak flow through the study area was analyzed using the FEMA QUICK-2 model (FEMA, 1997). The QUICK-2 model is an open-channel hydraulic model that computes water surface elevations in an open channel of arbitrary shape. The model was developed as the computer tool that accompanies the FEMA Zone A Manual (FEMA, 1995)

The hydraulic analysis of the study area focused on the reach that extends from the property at 23151 Mulholland Highway to approximately 300 feet downstream of the wooden bridge at the Bartelles property, with a total reach length of approximately 1,200 feet. The reach was represented by four trapezoidal cross sections with bottom widths and side slopes estimated based on the visual survey conducted for the reach as discussed previously. The slope of the channel invert is typically 0.028 and 0.02 feet/feet along the upper and lower reaches, respectively. The flow through the reach is expected to be mostly under open-channel conditions without much backwater effect given the relatively high lowcord elevations of the bridges and the relatively large capacity of the box culvert at the downstream end of the reach. The only location where pressurized flow may occur during high flows is the corrugated metal culvert at the Miller-Bartelles property line.

A step-backwater computation was first performed for the reach under open channel conditions without the corrugated metal culvert. The computation started from the downstream end of the reach and proceeded upstream to provide water surface elevations along the reach.

The effect of the culvert on water surface profile was estimated analytically since the QUICK-2 model does not compute pressurized culvert flows. The capacity of the 6-foot culvert was calculated to be approximately 461 cfs, which corresponds to approximately 45~50 year flow based on values presented in Table 1. Given a 100-year flow of 1,340 cfs as determined previously, a balance of 879 cfs needs to be transferred downstream during a 100-year flood. This excess flow would overflow the road crossing approximately in the form of a weir flow, which in turn would cause a rise of water surface elevation upstream of the culvert.

Based on the topography around the location of the culvert and a weir flow formulation, it was determined that the water surface elevation upstream of the culvert would rise by approximately 2.1 feet in order to discharge the balance of the 100-year flow. This amount of rise was added to the open-channel water surface profile just upstream of the

culvert to approximately account for the effect of the culvert under 100-year flood conditions.

Figure 1 shows the estimated 100-year water surface elevation profile.

4.4 Estimated Flood Boundary

The 100-year floodplain was approximately delineated for the study area based on the estimated 100-year water surface elevations and floodplain topography along the study reach. Figure 2 shows the estimated 100-year flood boundary.

The results indicate that both the Miller and Bartelles properties would be significantly flooded under 100-year flood conditions. The flooding on the Miller property would be caused primarily by the inadequacy of the culvert at the Miller-Bartelles property line. A portion of the water overflowing the road crossing would shed downgrade onto the Bartelles property in the form of a sheet flow and, combined with the higher-than-grade water levels in the Creek near the property, cause significant flooding on the property. This appears to be consistent with the local accounts and photographs documenting the 1980 storm that resulted in significant damage of the Bartelles property.

5. REFERENCES

Bartelles. 1980. Archive Photographs Provided by MRT.

FEMA. 1995. Managing Floodplain Development in Approximate Zone A Areas – A Guide for Obtaining and Developing Base (100-Year) Flood Elevations. Federal Emergency Management Agency.

FEMA. 1997. QUICK-2, Version 2.0. Federal Emergency Management Agency.

LACDPW. 1992. Calabasas Creek: Dry Canyon. Data Sheets Provided by MRT.

LACDPW. 2002. 2000-2001 Hydrologic Report. Los Angeles County Department of Public Works.

PCR. 2001. Watershed Management Area Plan for the Malibu Creek Watershed. Prepared for Las Virgenes Malibu Conejo Council of Goverments.

USGS. 2002. The National Flood Frequency Program, Version 3: A Computer Program for Estimating Magnitude and Frequency of Floods for Ungaged Sites. U.S. Geological Survey