COUNTY CROSSINGS

ANTIOCH,
CALIFORNIA

EXISTING DRAINAGE CONDITIONS

DRAFT REPORT

JULY 19, 2005

PREPARED BY

MATTERN & ASSOCIATES
3967 S PEARDALE DR LAFAYETTE CA
(925) 283-6315

INTRODUCTION

This report is a summary of existing drainage conditions at the proposed County Crossings development, Antioch, California. Included are estimates of peak storm flows for various storms for existing conditions, and an estimate of the water surface elevation and flow width of storm flows on the project site with existing drainage conditions.

EXISTING SITE CONDITIONS AND PROPOSED FACILITIES

The project site consists of an area of about 190 acres located east of Hillcrest Avenue, north of Highway 4, and south of 18th Street and Oakley Road, in the City of Antioch.

The main drainage course on the site is East Antioch Creek. This creek and its tributaries drain a large area south of the project site. Designated as Watershed 56 by Contra Costa County Flood Control District, the drainage area extends to a point south of Lone Tree Way in Antioch. On the project site, the creek is currently a natural open channel except in those areas where culverts carry flows under existing roads.

At Willow Avenue, an existing culvert, which is submerged on both sides of the road, and is estimated to be about a 48-inch structure, carries low flows under the road. High storm flows would overtop the road, which is about two feet above the low flow water surface at this location.

About 400 feet upstream of Willow Avenue, an existing earth embankment across the creek forms a permanent pond on the site. The embankment is about five feet high, and is probably not an engineered structure. The outlet from the pond consists of an open channel in a low point of the embankment, with broken concrete used to provide erosion protection at this location.

About 300 feet downstream of the point where East Antioch Creek enters the project site (below the exit of the creek from the culvert under Highway 4), there is an existing culvert under a dirt road on the site. This culvert is estimated to be about a 48-inch pipe, but the effective capacity is considerably reduced due to sediment and debris at the culvert entrance. Higher flows would cross the road at the low point on the road, and some broken concrete has been placed at this location to help reduce erosion.

The existing channel of East Antioch Creek on the project site upstream of Willow Avenue is heavily grown with cattails, willow trees and shrubs, and other vegetation.

This vegetation has the effect of reducing the effective hydraulic capacity of the channel, and increasing the water surface elevations in the creek during storm flows.

At the downstream area of East Antioch Creek on the project site, at the northwest area of the site, the Contra Costa County Flood Control District has plans for the Trembath detention basin. This basin would be formed by the construction of an embankment along the downstream side of the area, and constructing an outlet structure that would regulate outflows from the basin by restricting the flow capacity, and causing excess flows to be temporarily stored in the basin. The extent of the basin in upstream areas would be approximately to the forty foot contour of existing ground elevation.

Upstream of the site of the proposed Trembath Basin, and just north of the project site and east of Viera Road, is the existing Oakley Basin detention facility, which is currently maintained by the City of Antioch. A parcel south of this existing facility between Viera Road and Willow Avenue is owned by the County Flood Control District, and they have plans to expand the capacity of the Oakley Basin by excavating this area to provide additional water storage volume. The excavated material would be used for the construction of the Trembath Basin embankment. The basin would not extend east of Willow Avenue, and the flow of East Antioch Creek would drop into the basin at Willow Avenue.

The Oakley basin expansion and the Trembath detention basin are currently in the planning stage, with design and construction to follow within the next few years. After construction, the Flood Control District estimates that the 100-year flow in East Antioch would be reduced to less than 300 cfs, and would provide flood protection to the area of Lake Alhambra, downstream of the project site.

Existing runoff on the project site all flows directly into East Antioch Creek at various locations.

OFF SITE DRAINAGE

East Antioch Creek

The main branch of East Antioch Creek enters the site at the southeast corner, flowing through a double 8 x 8 box culvert under Highway 4. The watershed at this location is estimated to be about 4.75 square miles, which extends east to Empire Avenue, south to areas south of Lone Tree Way, and west to Dallas Ranch Road.

The watershed includes another Flood Control District detention facility, the Lindsey Basin, which is located near Live Oak Avenue and Laurel Road. This facility currently

consists of a 48-inch outlet pipe, with a 20 to 25 foot embankment around the water storage area.

South of Project Site

A watershed area east of Hillcrest Avenue and south of Highway 4 (Tributary A) drains an area of about 220 acres. From this watershed, four storm drains cross highway 4 (with sizes of 60-inch, 30-inch, 36-inch, and 42-inch pipes) and enter the project site from the south. These storm drains are continuous with the storm drains from the developed areas south of Highway 4. Flow from the four drains is combined into one storm drain, which carries the flow north into the area of the proposed Trembath Basin. This storm drain varies in size from 60-inch to 72-inch, and the outlet of the existing 72-inch CMP drain is half buried in sediment.

Another watershed farther east (Tributary B) drains an area of about 355 acres, with flows carried to a 54-inch storm drain carries storm flow under Highway 4. The area upstream of Highway 4 is an open natural channel located in the open space areas between developments. Downstream of Highway 4 on the project site, the existing channel is also a natural channel, which carries flow into East Antioch Creek east of Willow Avenue.

North of Oakley Road

There are a few relatively small areas which presently drain onto the site from the north. At Philips Lane, there is an area of about 3.5 acres which drains through an existing 18-inch drain south towards Oakley Road. The runoff from this drain is currently stored in a small percolation basin on the northwest corner of Philips Lane and Oakley Road, and the water percolates into the sandy soil. In the future, this storm drain would be extended to the south onto the project site, and it would also carry flow from the 5 acre site located to the west of Philips Lane, which is currently not developed.

An existing 18-inch storm drain between Philips Lane and Highway 4 onto the project site carries only flow originating from Oakley Road.

An area of about 7.5 acres west of Willow Avenue and east of Viera Road currently drains through a 24-inch pipe into the Oakley Basin just upstream of the outlet structure.

STORM FLOW ESTIMATES

In order to estimate the storm water flows at the project site, a hydrology model of the larger watersheds within and upstream of the project was developed.

The hydrology model was developed by incorporating the hydrologic characteristics of each watershed, including drainage area, average slope, amount of impervious area, and soil infiltration characteristics. Soils south of Highway 4 are generally clay loams, with relatively high runoff potential. Soils on the project site itself are mostly sandy, with relatively low runoff rates. Rainfall intensities were obtained for the desired frequency of storm, including 5-, 10-, 25-, 50-, and 100-year events, using the Contra Costa County rainfall intensity curves.

Storm Flow Results

A preliminary estimate of peak storm flows for the larger watersheds, based on existing conditions, is shown in Table 1. The flows for East Antioch Creek include the effect of detaining storm flows for this watershed in the County Lindsey detention basin.

WATER SURFACE AND FLOW WIDTH ESTIMATES

In order to estimate the extent of existing storm flows on the project site, a hydraulic analysis was made of the surface water flow through East Antioch Creek. This analysis was made by incorporating the existing characteristics of the channel in the Army Corps of Engineers computer program HEC-RAS. Ground topography was taken from the map completed in July 2005, with two foot contours and spot elevations shown. Stream cross sections started downstream of Willow Avenue, and continued to the upstream limit of the project site. The hydraulics of tributary B were not included in the analysis. The preliminary estimate of flows shown in Table 1 were used in the program, and projections of water surface elevations and other hydraulic properties of the storm flows were made.

The results of the hydraulic analysis are summarized in Table 2.

The water surface analysis predicts that large storm flows would overflow from East Antioch Creek into the former sand quarry area, starting at the point about 2900 feet upstream of Willow Avenue. The available existing topography indicates that overflows would occur into this area when water levels in East Antioch Creek exceed about 54 feet. Since many portions of the previous quarry area are lower than 54 feet, much of the water entering this area would tend to remain until it percolated into the soil. The flow of stormwater into this area would tend to reduce the magnitude of peak flows downstream from this location under existing conditions. No attempt was made to quantify the change in peak flow values that would be expected to occur due to these overflows.

Table 1 July 19, 2005
Estimated Existing Condition Peak Flows - Preliminary

Watershed	Drainage Area (acres)	Peak Flow - Preliminary				
		5-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
Tributary A	217	210	230	270	310	340
Tributary B	354	210	240	280	320	350
East Antioch Creek[1]	3040	120	160	210	260	300
Project Site	310	100	110	130	150	160

[1] Includes the estimated effect of Lindsey detention basin upstream.

Table 2 July 19, 2005
Estimated Existing Flow Width - Preliminary

Location Distance Upstream From Willow Ave. (100 ft)	10-year Storm		100-year Storm	
	Water Surface Elevation (ft)	Flow Width (ft)	Water Surface Elevation (ft)	Flow Width (ft)
0	43.1	340	43.3	350
2	43.9	140	44.2	245
4	45.6	275	46.0	305
5.85	49.3	85	49.8	105
6	49.9	185	50.5	210
8	50.0	230	50.6	250
10	50.0	125	50.7	160
12	50.1	120	50.7	135
14	50.1	195	50.8	205
16	50.2	155	50.9	175
18	50.3	135	51.0	140
20	51.1	135	51.6	145
22	51.5	155	52.0	200
24	52.6	70	52.8	75
26	54.5	100	55.1	115
28	55.0	160	55.6	175
29	55.1	980	55.6	1000
30	55.0	130	55.6	165
32	56.2	95	56.5	105
34	57.8	125	58.3	135
36	59.8	50	60.4	60
38	60.9	205	61.5	220
39.3	61.4	25	61.8	30