LOCATION HYDRAULIC STUDY

Reconstruct Interchanges at Linden Avenue and Casitas Pass Road
SB-101-2.2/3.3 4482U0
August 25, 2008

INTRODUCTION

The purpose of this study is to identify encroachments created by this project on the base (100-year) floodplain. The study was prepared in accordance with 23 CFR, Section 650.

PROJECT DESCRIPTION

This project proposes to reconstruct the interchanges at Casitas Pass Road and Linden Avenue, and to extend Via Real across Carpinteria Creek to connect with the Casitas Pass Road Interchange. The project considers the No-Build and four build alternatives. All of the build alternatives propose to replace the Carpinteria Creek bridges at Route 101 and construct a new bridge at Via Real over Carpinteria Creek. Alternatives 1 and 4 propose to replace the northbound bridge at Route 101 on Franklin Creek.

FLOODPLAIN BACKGROUND

The creeks in the Carpinteria Valley Watershed are subject to flooding in the relatively flat region of the valley floor between the coastal mountains and the ocean. Rainfall in the area can be of short duration and high intensity. The creeks carry large amounts of debris.

Large storms in 1966 and 1969 caused considerable damage throughout the Carpinteria Valley Watershed due to flooding, erosion and debris deposition. Flooding in 1969 overtopped the Carpinteria Creek Bridges and washed out the approaches, causing Route 101 to be closed for 2 weeks. The Santa Barbara County Flood Control District flood mapping of the 1969 storm shows flow escaping from Carpinteria Creek and running down Route 101 to Franklin Creek. The Santa Monica and Franklin Creek channels were lined in 1976 in response to these storms. Debris basins were constructed on tributaries of Carpinteria Creek in 1971 in response to the storms and a fire in the watershed.

The USGS gage on Carpinteria Creek indicates that the greatest storms of record occurred during 1972 and 1995. The bridges over both Carpinteria and Franklin Creeks withstood the 1972 flows with no overtopping and only a small amount of revetment damage at Carpinteria Creek. The 1995 flows overtopped the Franklin Creek bridges and closed the highway, but the bridges and approaches remained intact. There is no record of overtopping or flooding at Carpinteria Creek in 1995.

The bridges at Franklin and Carpinteria Creeks were constructed in 1954 as part of the present alignment of Route 101. The Carpinteria Creek Bridge was designed to pass 153 cms (5,400 cfs), the greatest storm of record at that time. The Franklin Creek Bridge was designed for 37 cms (1,300 cfs), but the channel has been lined since then to pass 99 cms (3,500 cfs). The lined channel at Franklin Creek is deeper and narrower than the natural channel was. The top of the channel is below the soffit of the Route 101 bridges.

The attached copy of the FEMA Flood Insurance Rate Map (FIRM) for the City of Carpinteria shows the base floodplains for Carpinteria and Franklin Creeks.

Carpinteria Creek

The FEMA Flood Insurance Study (FIS) determines that the 100-year flow for Carpinteria Creek is 340 cms (12,000 cfs).

Upstream of Route 101

The base floodplain shown in the FEMA FIRM for Carpinteria Creek is contained in the main creek channel upstream of Via Real. Near Via Real, it expands into its overbanks.

At Route 101

The FIS assumes that the existing Route 101 bridges at Carpinteria Creek will be partially blocked with debris at the time of the peak 100-year flow. It states that under those conditions the bridges are overtopped and 170 cms (6,000 cfs) escapes onto the highway. Route 101 is predominantly below the adjacent topography in a full cut section from Carpinteria Creek to Linden Avenue and is graded towards Franklin Creek. The escaped flow travels down Route 101 from Carpinteria Creek to Franklin Creek. The FIRM shows the resulting floodplain as being contained along Route 101 to Linden Avenue, then spreading out to flood a large area adjacent to Franklin Creek.

Downstream of Route 101

Downstream of Route 101, the base floodplain is defined assuming that a maximum of 255 cms (9,000 cfs) will pass through the bridges before they are further blocked by debris and reduced in capacity as described above. In addition to the base floodplain, a regulatory floodway is defined from the Pacific Ocean to Route 101. The floodway is defined for the 100-year flow of 340 cms (12,000 cfs), assuming that the highway bridges could fail or be replaced. The floodplain and floodway definitions are based on inconsistent assumptions. Representative from FEMA and the City of Carpinteria have stated that this discrepancy should be corrected and that both the floodplain and floodway downstream of Route 101 should be mapped for the full 100-year flow.

Franklin Creek

The FIRM shows the100-year flow of 99 cms (3,500 cfs) for Franklin Creek contained within the creek channel.

FLOODPLAIN ENCROACHMENTS

Federal Regulations

CFR 23, Section 650, defines significant encroachments and risks for the base floodplain. An encroachment is any work done within the limits of the floodplain. A significant encroachment is one which could significantly interrupt a route required for emergency operations, pose a significant risk, or significantly impact natural and beneficial floodplain values. Risks are consequences of encroachments that could lead to flooding which would cause property loss or hazard to life.

Carpinteria Creek

Encroachments

On Carpinteria Creek, the project proposes to replace the Route 101 bridges and add a bridge at Via Real.

The proposed bridges for Route 101 would allow the FEMA 100-year flow of 340 cms (12,000 cfs) to return to its historic course. The bridge replacement removes a floodplain encroachment and does not create one. The flow diversion towards Franklin Creek and the floodplain it creates on Route 101 and adjacent to Franklin Creek would be eliminated.

Upstream of Route 101, the Via Real bridge would encroach on the base floodplain, but the effects would not be significant. The combined effects of replacing the bridges at Route 101 and adding the bridge at Via Real create localized increases and decreases in base flood elevations, but do not significantly change the base floodplain.

Downstream of Route 101, the FEMA FIRM should be corrected to define the floodplain for the full 100-year flow. Caltrans will work with the City of Carpinteria to correct the map as part of this project. Once the FIRM has been corrected, the project would have no effect on the base floodplain downstream of Route 101.

The project would not create a significant encroachment to the base floodplain for Carpinteria Creek.

Revised Hydrology

The FEMA 100-year flow of 340 cms (12,000 cfs) was developed with 32 years of data from the USGS gage on Carpinteria Creek. Caltrans revised the hydrology to reflect 61 years of data from the same gage, including very high flows from 1995 and 1998. The data were analyzed using the Log-Pearson Type III distribution. The revised 100-year flow is 378 cms (13,400 cfs). In order to revise the FEMA FIS hydrology, the proposed flow must vary significantly from the flow developed by FEMA. The Caltrans flow doesn't meet the criteria set by FEMA to allow revision of the FIS flow. The Caltrans flow will be used for bridge design and the FEMA flow will be used for floodplain issues.

Franklin Creek

Alternatives 1 and 4 for this project would replace the northbound bridge at Franklin Creek. The existing lined channel contains the 100-year flow at this location. The proposed bridge would have a greater waterway area than the channel and therefore would not encroach on the base floodplain.

CONCLUSION

None of the work proposed by this project would significantly encroach on the base floodplain of either Carpinteria or Franklin Creek. The proposed replacement of the Route 101 bridges at Carpinteria Creek would eliminate an existing encroachment and flooding along Route 101 and adjacent to Franklin Creek. Caltrans will work in cooperation with the City of Carpinteria to revise the FIRM for Carpinteria Creek.

REFERENCES

- Federal Code of Regulations 23, Section 650
- FEMA Flood Insurance Study, City of Carpinteria, Revised 9/18/85
- FEMA Flood Insurance Rate Map, City of Carpinteria, Community Panel Number 060332 0005E, Revised 9/18/85
- FEMA Floodway Map, City of Carpinteria, Community Panel Number 060332 0005E, Revised 7/29/93
- Santa Barbara County Flood Control District Flood Reports from 1969, 1995 and 1998
- Carpinteria Valley Watershed Work Plan, November 1968
- Caltrans Structures Department Preliminary Bridge Reports for Carpinteria and Franklin Creeks
- Caltrans Structure Maintenance Department Supplementary Bridge Reports
- Caltrans Hydraulics Department Historic Records

ATTACHMENT

- FEMA Flood Insurance Rate Map

PREPARED BY:

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Wendelyn E. Wickham, P.E. Date

Caltrans District 5 Hydraulics