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MEMORANDUM

TO:	Natalie Noyes, David J. Powers & Associates	DATE:	10/24/19
FROM:	Melissa Reardon, PE (C 90262) Caitlin Gilmore, PE (C 76810)	JOB#:	DPOW.104.18
SUBJECT:	Hydraulic Analysis for 3700/3710 Valle Verde Drive Project		

Schaaf & Wheeler has been retained by David J. Powers & Associates to provide a hydraulic analysis for a proposed project (Project) at 3700/3710 Valle Verde Drive in Napa, CA (City). The Project proposes the renovation of an existing vacant building at 3700 Valle Verde Drive to create 66 affordable housing units and the construction of a new multi-family residential building with 24 units at 3710 Valle Verde Drive. The City may also require partial removal of Zerba Bridge as a condition of the Project.

The Project is partially located in a Federal Emergency Management Agency (FEMA) 100-year Zone AE floodplain and partially in a 500-year Zone X floodplain associated with Salvador Creek, as shown in Figure 1, based on Flood Insurance Rate Map (FIRM) panel 06055C0508F and the Letter of Map Revision (LOMR) dated February 20, 2012. The Project is also subject to City Municipal Code requirements regarding changes to the floodplain.

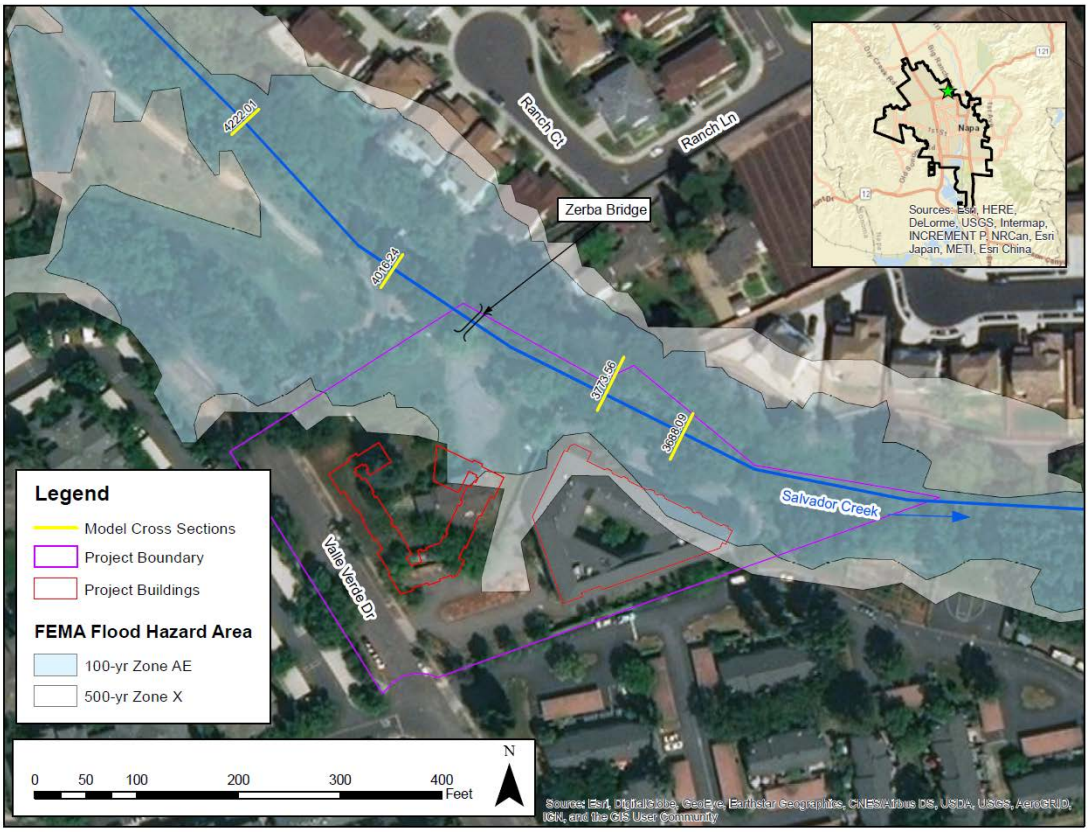

Figure 1. Project Location and Effective FEMA Flood Hazard Areas

Schaaf & Wheeler has been tasked with the hydrologic and hydraulic analysis for the Project as part of the Project's California Environmental Quality Act (CEQA) documentation. For this analysis, Schaaf & Wheeler has obtained the FEMA model for Salvador Creek and updated it to reflect existing conditions. The potential impact of the proposed Project on the floodplain has been analyzed for FEMA property removal thresholds, City Municipal Code requirements, and CEQA thresholds of significance. The specific requirements for each of these impacts are described in the following sections.

Salvador Creek Model Development

The model used in this analysis is based on the FEMA model used to develop the FIRM for Salvador Creek. The FEMA model received was the model used in the LOMR dated February 20, 2012, to update Flood Insurance Study (FIS) 06055CV000C. Schaaf & Wheeler received this model and discovered that the software originally developed for the model, MIKE FLOOD 2008, is no longer supported by its developer, DHI Water & Environment. Schaaf & Wheeler updated the model to MIKE FLOOD 2016 for this analysis. While there are minimal differences in the results, which Schaaf & Wheeler attributes to software engine updates, updating the model to 2016 is viewed as essential.

Initially, it was unclear whether the 2012 LOMR model provided was on the NGVD or NAVD datum. Upon comparing the model results to the mapped BFEs, it appeared that the model was on NAVD. However, later review indicated that the model may have been on NGVD and suggested that there may have been another model submitted to FEMA. Schaaf & Wheeler reviewed the model and accompanying report that was received from FEMA as well as models provided by consultants who had developed the model for the 2012 LOMR and who had subsequently built upon the 2012 LOMR model for separate analysis. We conclude the model provided by FEMA was in fact the model submitted as part of the 2012 LOMR and the model was on the NGVD datum. However, this implies that the model base flood elevations (BFEs), once converted to NAVD, are approximately one to two feet higher than the mapped BFEs near the Project site, as shown on Figure 2. At other locations, such as near Lassen Street and Valencia Street shown in Figure 3, the model BFEs are much closer to the mapped BFEs.

It is unclear why the mapped BFEs from the 2012 LOMR do not match the BFEs from the model provided by FEMA near the Project site; however, for this analysis, it is assumed that the model results provide more accurate BFEs than the effective FIRM. The apparent increase in BFEs shown herein when compared to the FIRM is not a result of the Project; it is instead assumed to be an error in the FEMA mapped BFEs. We are evaluating project impacts relative to changes in the BFE; not changes from the mapped values.

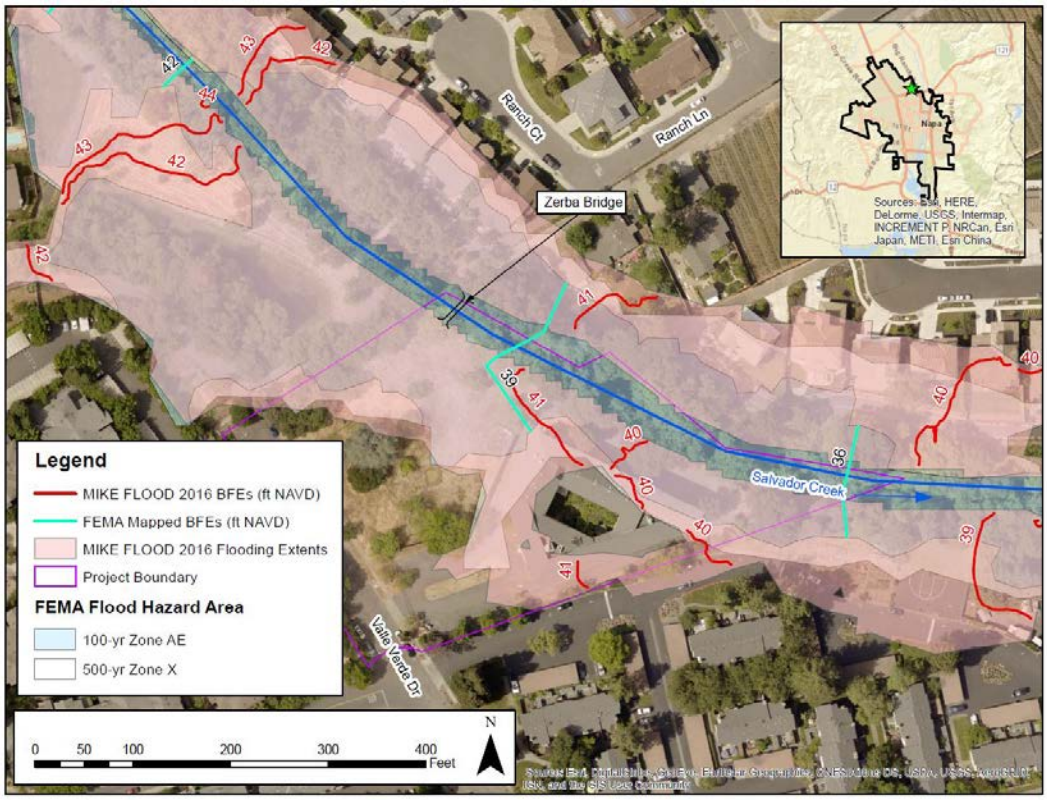

Figure 2. Comparison of Mapped BFEs and Model BFEs at Project Site

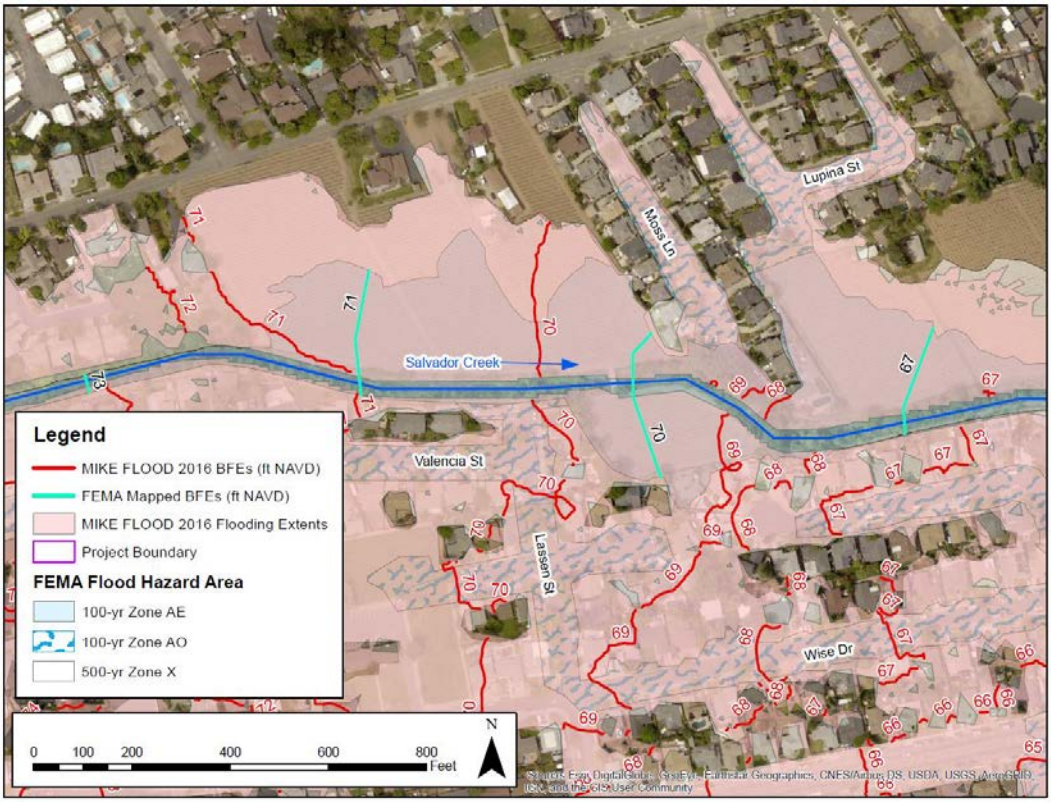

Figure 3. Comparison of Mapped BFEs and Model BFEs near Valencia St and Lassen St

Pre-Project Model Development

For this analysis, the 2012 LOMR model was further updated based on dimensional data for Zerba Bridge, at the northern boundary of the Project, collected during a site visit by Schaaf & Wheeler in March 2019. The existing model included the bridge deck and abutments only and are approximate. Updates included adding pier losses and refining bridge dimensions based off of the existing guardrails. This generally results in increased base flood elevations at the project site when compared to the effective map, but more accurately represents current conditions.

The 2D terrain for the pre-Project scenario was also updated based on survey data provided by David J. Powers & Associates for the Project site. In addition to changes to the terrain based on ground elevation, the existing building at the Project site was added as a blockage to the terrain as the building was not explicitly included in the 2D terrain previously.

Post-Project Model Development

For the post-Project scenario, the 2D terrain from the pre-Project scenario has been revised further based on proposed grading provided by David J. Powers & Associates. Changes to the terrain are limited to the northwest half of the Project site where the new building is proposed. In addition to changes to the terrain based on ground elevation, the new building has been added as a blockage.

Post-Project with Partial Bridge Removal Model Development

The City may require a portion of Zerba Bridge to be removed as part of the Project. The bridge deck and pier would be removed while the abutments would remain. For this final scenario, the model is revised to reflect the partial removal of Zerba Bridge in the 1D channel. The 2D terrain from the post-Project scenario was used in this final scenario to include the proposed grading changes and the new building.

Base Flood Elevations and Creek Water Surface Elevations

For the new building construction on the Project site, the BFE based on the effective FEMA model updated to MIKE FLOOD 2016 is 41.6 feet NAVD88. However, the BFE based on the pre-Project scenario model is 42.1 feet NAVD88. Similarly, for the existing building, the BFE based on the effective FEMA model updated to MIKE FLOOD 2016 is 41.5 ft NAVD88, but the BFE based on the pre-Project scenario model is 42.1 ft NAVD88. The maximum 100-year creek water surface elevation that corresponds with these base flood elevations is shown in Figure 2.

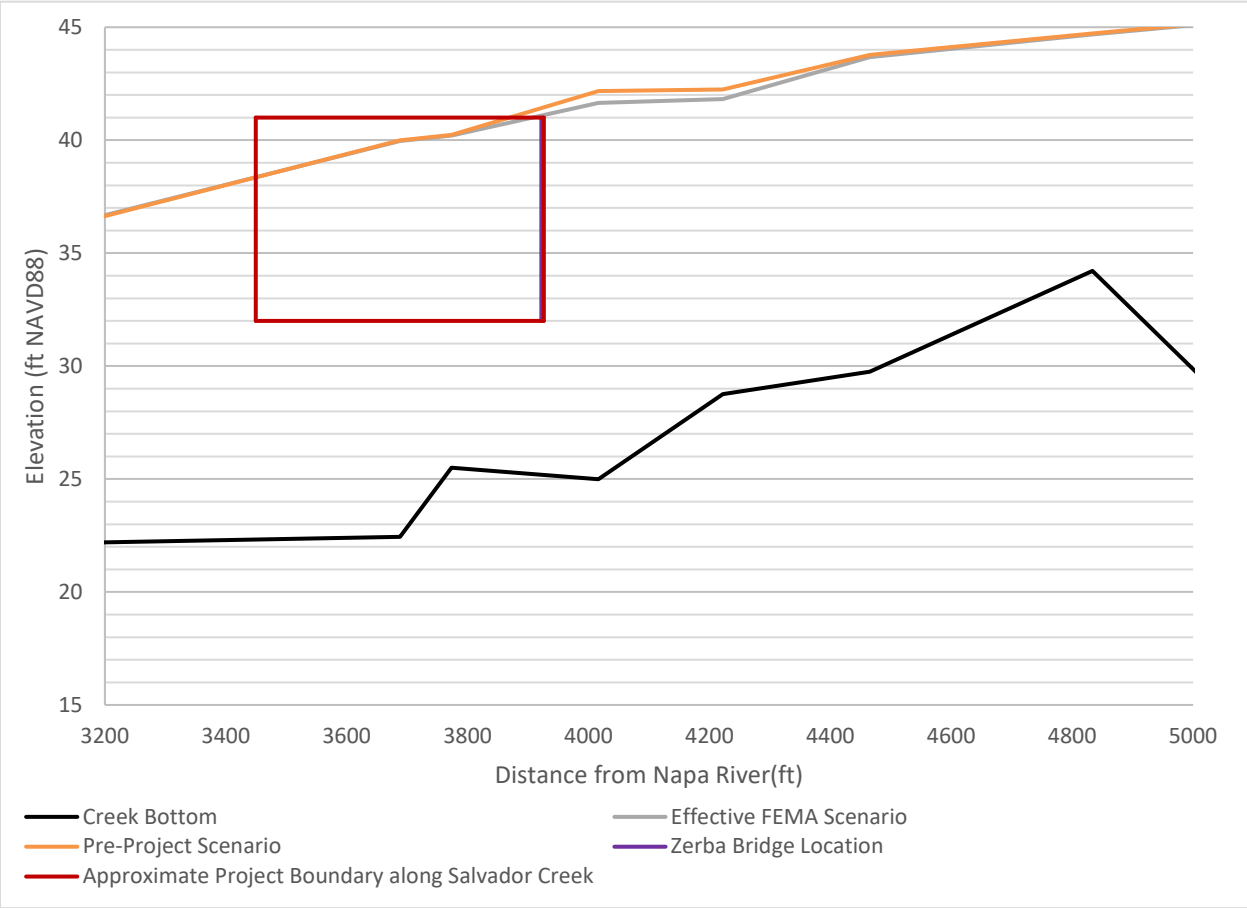

Figure 4. Salvador Creek Profile of Effective FEMA and Pre-Project Scenarios

With the new building and proposed grading around it, the BFE at the new building increases to 42.5 ft NAVD88. This increase is due to the proposed grading on site, which will raise the ground surface near the new building and impede flood flows. The BFE at the existing building, however, remains at 42.1 ft NAVD88.

The City may require a portion of Zerba Bridge to be removed as part of the Project, as discussed in the previous section. Under this scenario, the BFE at the new building is 41.4 feet NAVD88 and the BFE at the existing building is 41.7 feet NAVD88. A summary of the model scenarios and resultant BFEs at the new and existing buildings are shown in Table 1.

Table 1 – Building Base Flood Elevation Scenarios (feet NAVD88*)

Scenario	Existing Building BFE	New Building BFE
Effective FEMA Model updated to MIKE 2016	41.5	41.6
Pre-Project Scenario (updated existing bridge and site topo)	42.1	42.1
Post-Project Scenario (bridge remains in place)	42.1	42.5
Project Impact with bridge remaining	0.0 foot	0.4 foot
Post-Project with Partial Bridge Removal Scenario	41.4	41.7
Project Impact with partial bridge removal	-0.7 foot	-0.4 foot

**Feet NAVD88 = Feet NGVD29 + 2.65 feet*

***2012 LOMR FIRM mapped values are incorrect*

FEMA Implications

To remove a structure from the special flood hazard area, the lowest grade adjacent to the structure must be greater than the base flood elevation. Note it is not a requirement of the City Municipal Code to remove structures from the floodplain. As discussed in the previous section, the base flood elevation for the new building is 42.5 feet NAVD88 and the existing building is 42.1 feet NAVD88 which is based on the Post-Project Scenario with floodplain blockage by the new building and grading with no bridge removal.

The proposed lowest adjacent grade in the information provided by David J. Powers from the project engineer is 42.1 ft on the northern corner of the building, however most of the other grades immediately adjacent to the building are closer to 43 ft. In order to be removed from the special flood hazard area, the new building must have a lowest adjacent grade equal to or greater than the BFE of 42.5 ft for the Post-Project Scenario where the bridge remains in place.

The existing building has a lowest adjacent grade of 37.2 feet based on a topographic survey provided by David J. Powers & Associates. Most, if not all, of the building's adjacent grades are also below the base flood elevation of 42.1 feet. Consequently, the existing building could not be removed from the special flood hazard area.

Table 2 – Structure Elevations

Location	Elevation (ft NAVD)	Max BFE* (ft NAVD)	Above BFE?
Lowest Adjacent Grade to New building	42.1 ft	42.5 ft	No**
Finished Floor elevation of New building	43.7 ft	42.5 ft	Yes
Lowest Adjacent Grade to Existing building	37.2 ft	42.1 ft	No
Finished Floor elevation of Existing building	41.7 ft	42.1 ft	No

**Based on the Post-Project Scenario where the bridge remains in place*

***Lowest adjacent grade may be closer to 43 ft NAVD, which would be above the BFE.*

Municipal Code Implications

In order to meet City Municipal Code and the adopted California Building Code:

1. the finished floor elevations must be one foot above the 100-yr base flood elevation; and
2. the Project must not result in (a) greater than 1 foot cumulative impact in the floodplain or (b) greater than 1 foot rise in the water surface profile of the creek.

A cumulative rise impact of 1 foot within the floodplain (Condition 2a above) is consistent with City Municipal Code § 17.38.040.A.4, County of Napa Code of Ordinances Section 16.04.585 and the National Flood Insurance Program code 44 CFR § 60.3(c)(10).

As stated in the previous section, the base flood elevation increases to 42.5 feet NAVD88 with construction of the new building. New building finished floor elevation per the information provided by David J. Powers is 43.7 feet, which is greater than the 100-year base flood elevation plus one foot of freeboard required by the California Building Code. The existing structure for renovation has a finished floor elevation of 41.7 feet based on survey provided, which below the BFE of 42.1 ft. Therefore, the new building meets the first condition of the City Municipal Code requirements, but the existing building does not.

Floodplain Impacts: Post-Project Scenario

The Project with no bridge removal results in an increase in floodplain elevations directly upstream of the Project due to overbank floodplain blockage as shown in Figures 5 and 6. The maximum cumulative impact is an increase in BFE of 0.34 foot, which is less than the threshold of one foot. Therefore, the proposed Project meets the second condition of the Municipal Code requirement.

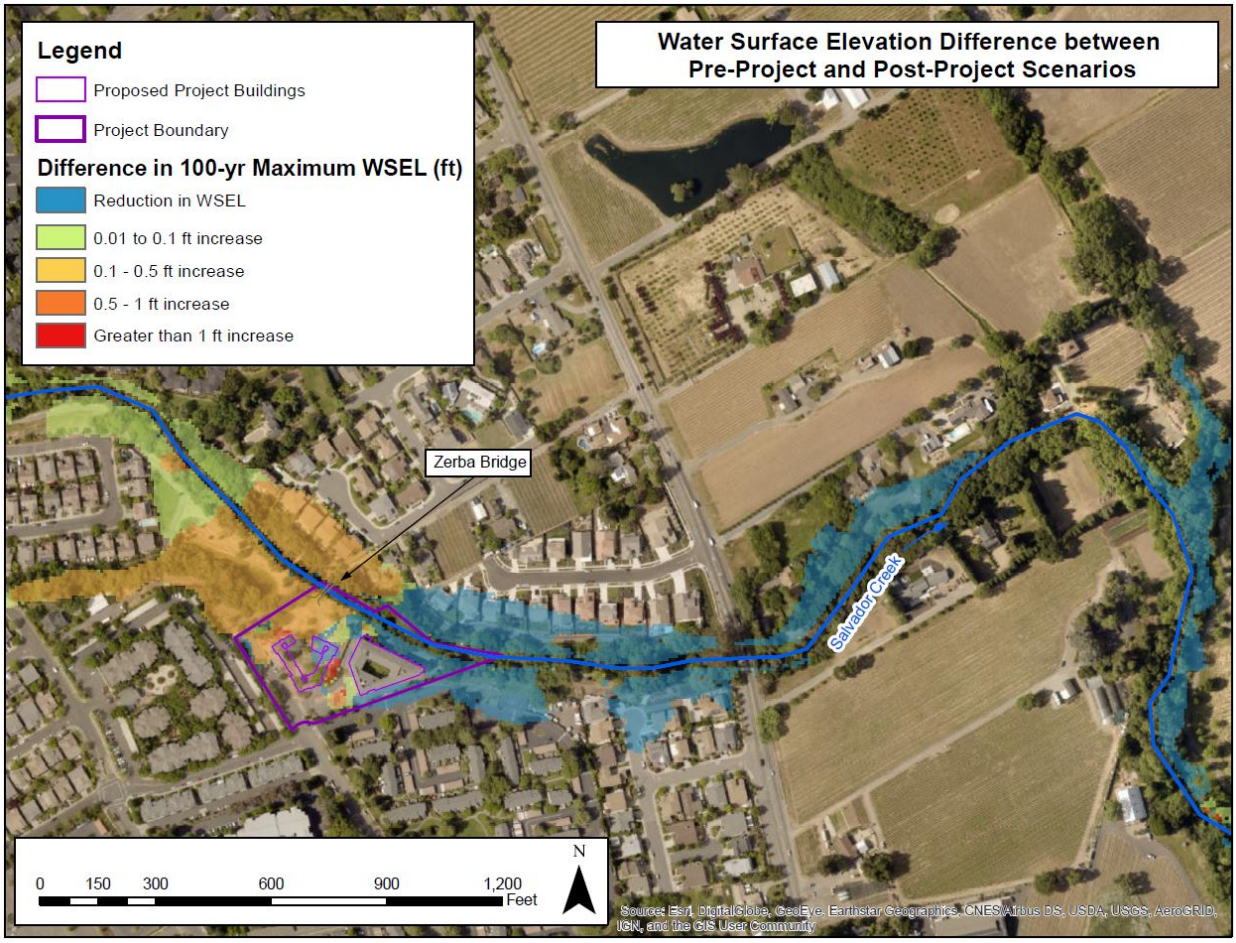

Figure 5 – Floodplain Impacts of Project Construction Only

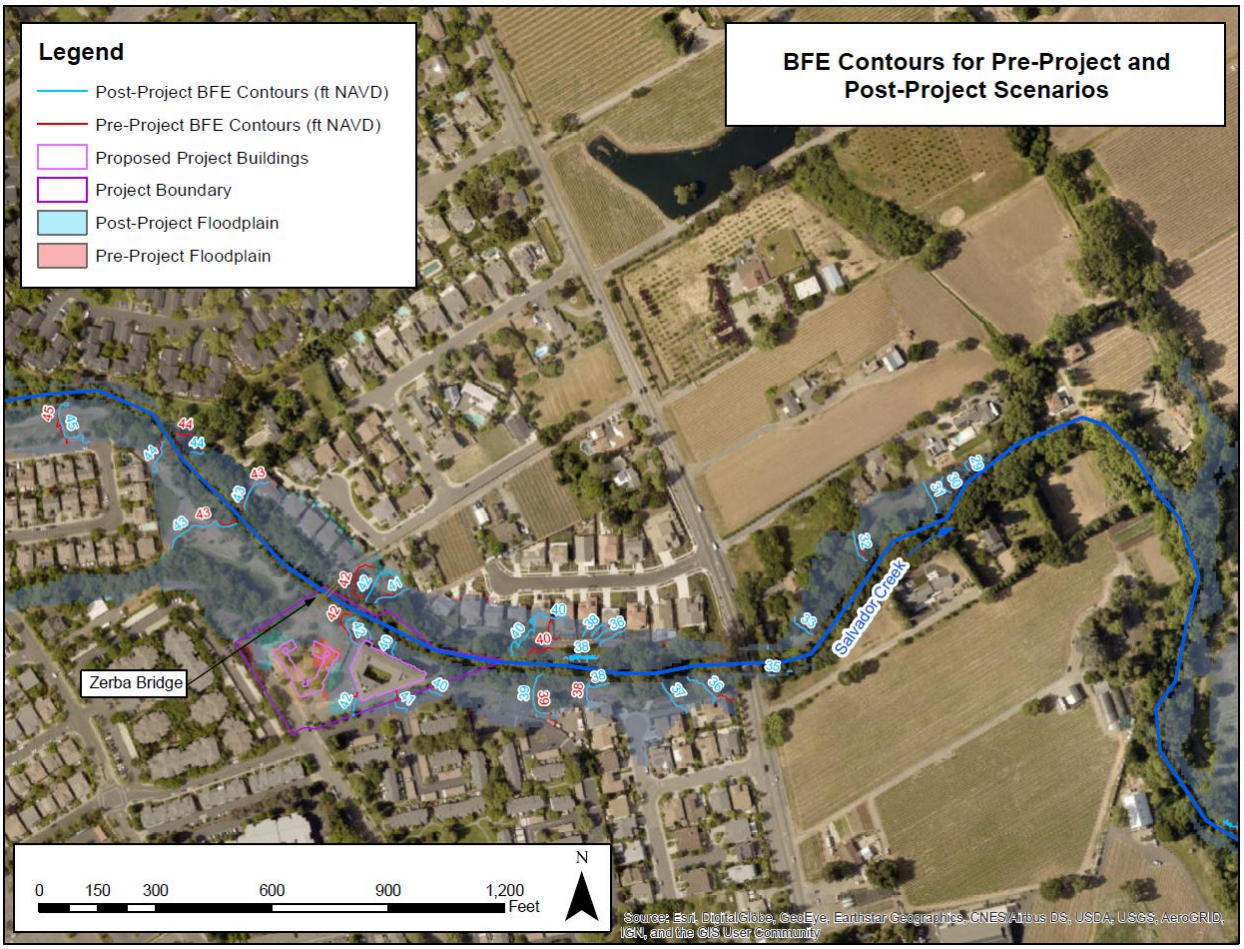

Figure 6 – Base Flood Elevation Contour Impacts of Project Construction Only

Under the post-Project scenario, the water surface elevations increase by about 0.3 foot around seven structures upstream of the Project. Elevation data is provided in Table 3. For all but one property (2123 Big Ranch Road), the lowest adjacent grade is higher than both the pre- and post-Project BFEs. At 2123 Big Ranch Road, the lowest adjacent grade is less than both the pre- and post-Project BFEs. In no location is a structure added to the floodplain by the project impacts.

Table 3 – BFE Impacts to Nearby Upstream Structures

Address	Pre-Project BFE (ft NAVD)*	Post-Project BFE (ft NAVD)*	Maximum BFE Impact (ft)*	Lowest Adjacent Grade (ft NAVD)**
2155 Ranch Ct	43.56	43.59	0.34	45.0
2145 Ranch Ct	42.29	42.55	0.34	44.4
2135 Ranch Ct	42.26	42.52	0.33	43.7
2215 Ranch Ct	42.18	42.52	0.33	43.8
2115 Ranch Ct	42.13	42.48	0.33	43.3
2123 Big Ranch Road	42.05	42.38	0.32	40.5

** Location of pre-Project BFE, post-Project BFE, and maximum BFE impact may not be the same. As a result, the maximum BFE impact may be greater than the difference between the pre- and post-Project BFEs.*

*** Lowest adjacent grade is based on elevation documentation provided by the City.*

Floodplain Impacts: Post-Project with Partial Bridge Removal Scenario

There are slight increases in flood elevations of less than 0.1 foot downstream of the Project due to the removal of the bridge deck and piers while the impacts from blockage due to the new building are lessened. There is generally a reduction in floodplain depth upstream of the project when partial bridge removal is included. These cumulative changes are less than 1 foot, as shown in Figures 7 and 8. Consequently, the Project plus partial bridge removal also meets the second condition of the City Municipal Code requirements.

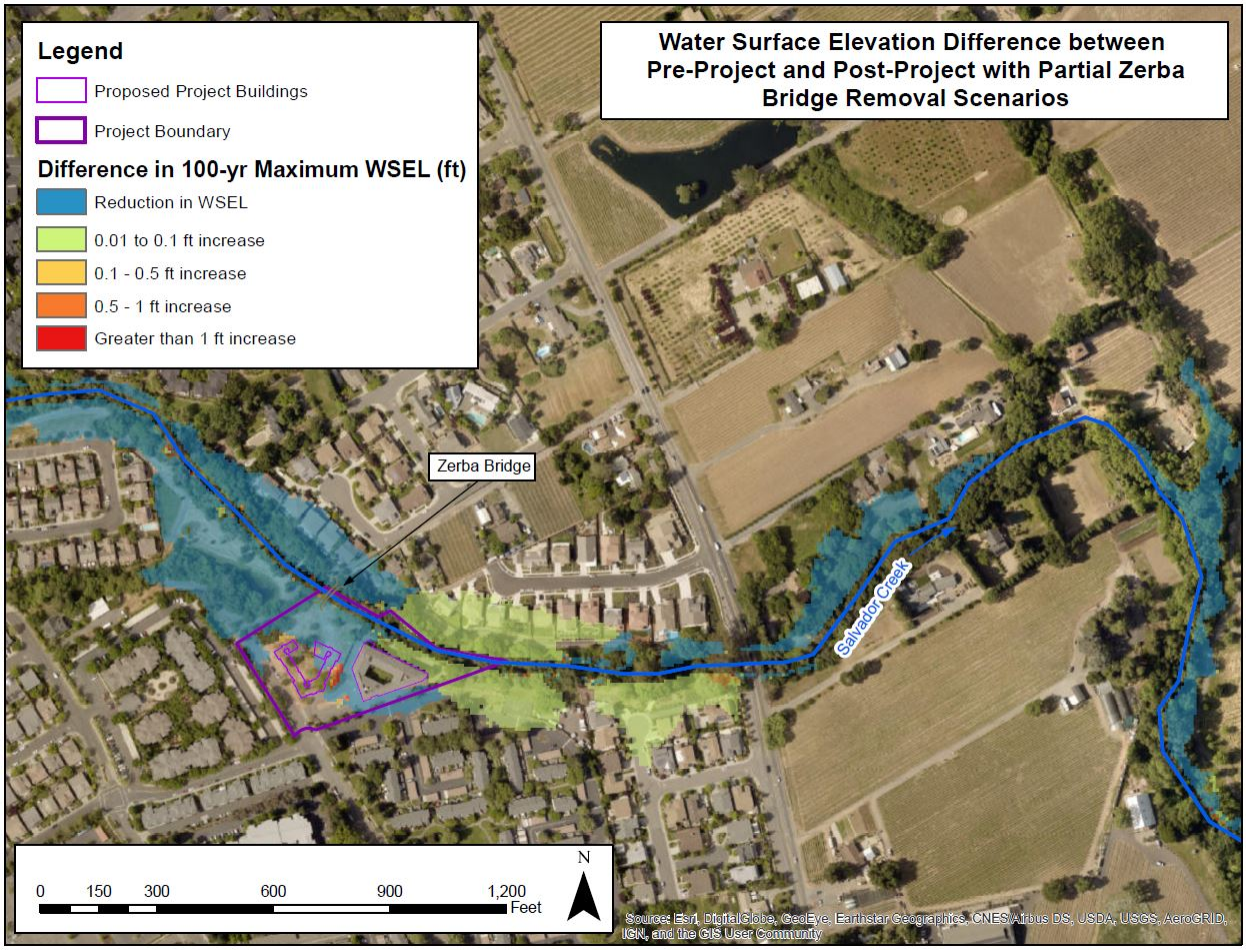

Figure 7 – Floodplain Impacts of Partial Bridge Removal and New Building Construction

There are no structures located in an area where the water surface elevation increases by more than 0.1 foot. However, there are structures where an increase less than 0.1 foot occurs. Elevations for selected structures are given in Table 4.

Under the pre-Project condition, the lowest adjacent grade is below the pre-Project BFE for all but three structures. For the other three structures (987, 971 and 979 Serendipity Way), the lowest adjacent grade is equal to or greater than the pre-Project BFE. Under the post-Project with partial bridge removal condition, the lowest adjacent grade of all but one of the structures (979 Serendipity Way) are below the post-Project BFE.

Table 4 – BFE Impacts to Nearby Downstream Structures

Address	Pre-Project BFE (ft NAVD)*	Post-Project with Bridge Removal BFE (ft NAVD)*	BFE Impact (ft)*	Finished Floor Elevation (ft NAVD)**	Lowest Adjacent Grade (ft NAVD)**
987 Serendipity Way	40.26	40.29	0.07	41.26	40.26
979 Serendipity Way	40.16	40.21	0.07	41.26	40.26
971 Serendipity Way	40.16	40.22	0.06	41.16	40.16
963 Serendipity Way	40.15	40.20	0.06	40.96	39.96
955 Serendipity Way	40.13	40.16	0.07	39.56	38.56
947 Serendipity Way	40.10	40.21	0.07	39.46	38.46
939 Serendipity Way	39.84	39.87	0.03	38.96	37.96
931 Serendipity Way	38.31	38.32	0.02	38.86	37.86

** Location of pre-Project BFE, post-Project BFE, and maximum BFE impact may not be the same. As a result, the maximum BFE impact may be greater than the difference between the pre- and post-Project BFEs.*

*** Finished floor elevations are based on as-builts provided by the City. Lowest adjacent grade based on pad elevations in as-built drawings provided by the City.*

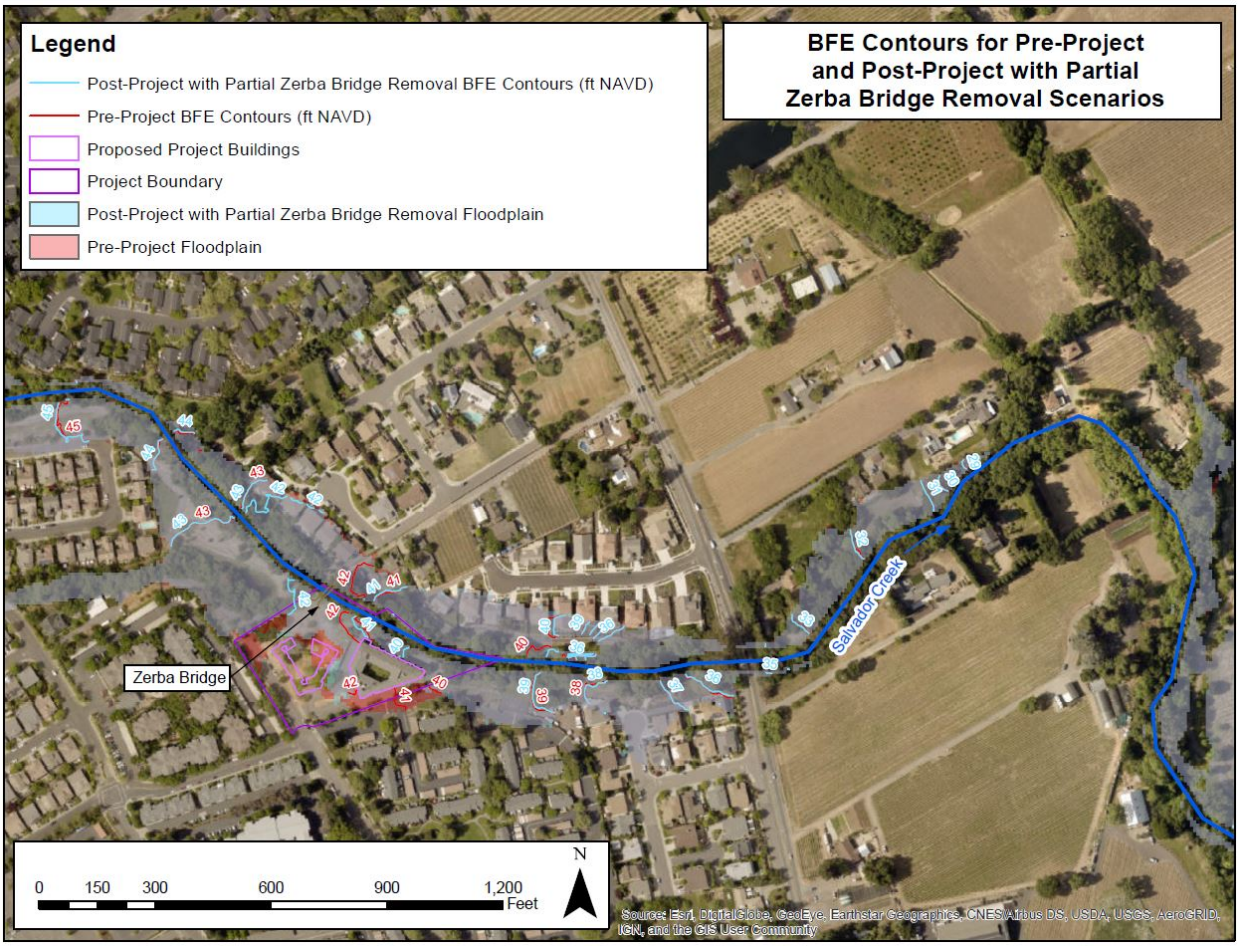

Figure 8 – BFE Contour Impacts of Partial Bridge Removal and New Building Construction

Creek Water Surface Profile Impacts

Water surface elevations in Salvador Creek upstream of the Project increase in the post-project scenario, but these increases are not greater than 1 foot, as shown in Figure 7. The Project with no bridge removal therefore meets both aspects of the second condition of the Municipal Code requirement.

With the post-project plus partial bridge removal scenario, there are slight decreases in in-channel water surface elevation upstream of the Project whereas there are slight increases at the Project boundary. These slight increases are not greater than 1 foot. Consequently, the post-project plus partial bridge removal meets both aspects of the second condition of the City Municipal Code requirements.

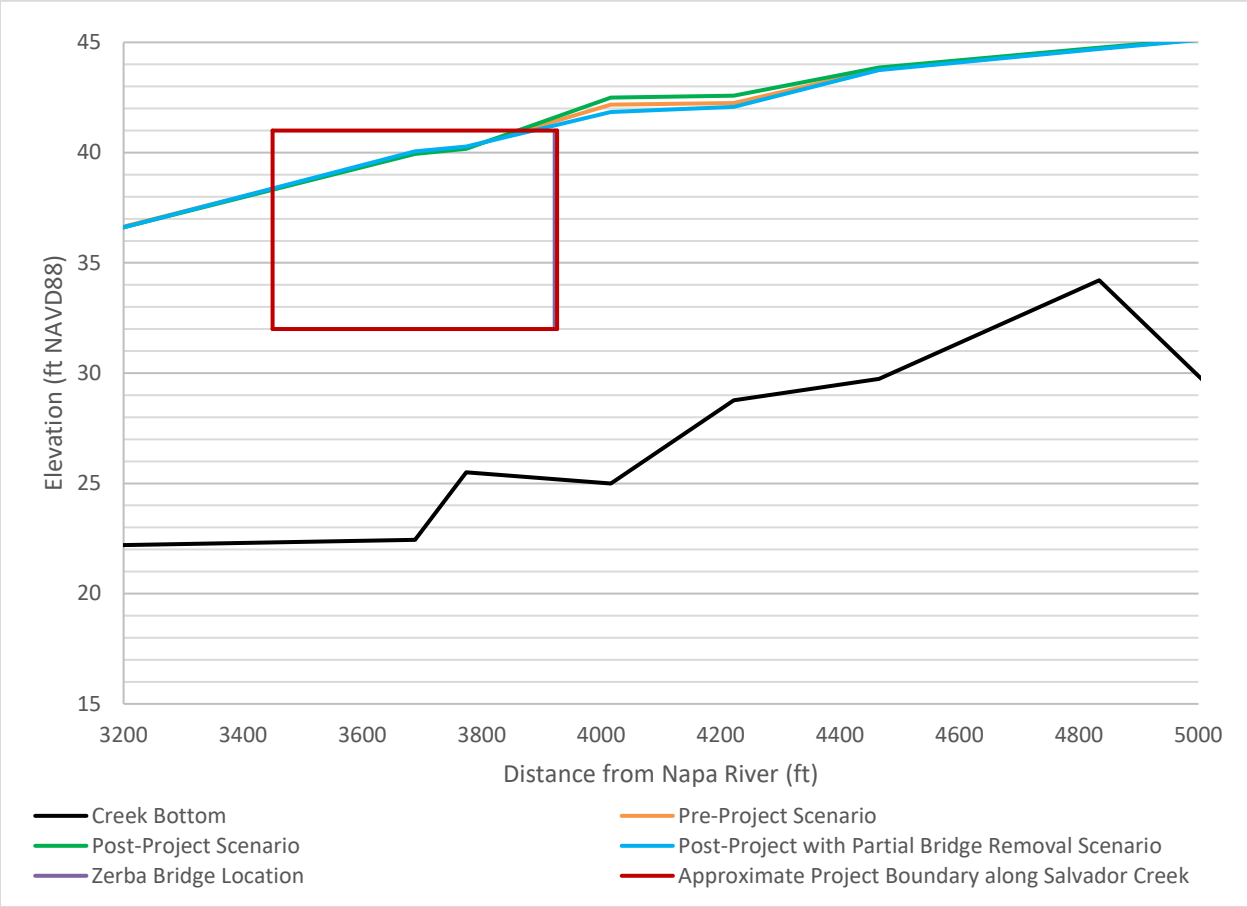

Figure 9. Salvador Creek Profile of Project Scenarios

Big Ranch Specific Plan Implications

The Big Ranch Specific Plan (BRSP) EIR covers the project location along Salvador Creek. The project site is located between Bel-Aire/Gasser Tributary confluence and the Big Ranch Road Bridge is what is called Zone 4 in the BRSP EIR. The BRSP EIR included the development of a one dimensional HEC-2 hydraulic model of Salvador Creek dated 1995 which extends upstream of the Bel-Aire/Gasser Tributary and does not explicitly model the Project site. At the time of the BRSP EIR the known development was occurring upstream of the Bel-Air/Gasser Tributary and therefore Zone 4 was not modeled. However, the mitigation measures proposed included the Project reach.

Mitigation Measure 4.4-3 was developed to minimize potential flood impacts and includes either a setback distance from top of bank of 100 feet for any fill or development activities or a maximum increase in post-project upstream flood elevation of 0.05 feet based on a site-specific flood analysis. The Post-Project (without bridge removal) results in up to 0.34 feet of impact upstream and therefore does not meet this criteria. The Post-Project with Partial Bridge Removal has less than 0.00 feet of impact upstream and therefore meets the criteria of the BRSP EIR Mitigation Measure 4.4-3.

CEQA Threshold of Significance and Conclusions

For the CEQA analysis associated with this Project, threshold of significance include:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would impede or redirect flood flows.

As discussed in the Municipal Code Implications section, the post-Project scenario and post-Project with partial bridge removal scenarios both results in less than 1 foot of cumulative impact in the floodplain and less than 1 foot rise in the water surface profile of the creek. Both project scenarios meet Municipal Code requirements.

The post-Project scenario results in less than 0.3 foot of impact to seven structures; placing no structure in the floodplain which was not previously impacted. The post-Project scenario with partial bridge removal results in less than 0.1 foot of impact.

Therefore, the post-Project scenario and post-Project with partial bridge removal scenario would not significantly impede or redirect flows; and both scenarios meet the CEQA threshold without requiring mitigation.