

# **Appendix HY-2**

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Beach Stone Lakes Impact Analysis



**TECHNICAL MEMORANDUM**

To: Todd Smith – Sacramento County Planning Department  
From: Ken Giberson  
Date: March 2, 2018  
Subject: Beach Stone Lakes Area Impact Analysis  
For NewBridge and Mather South Developments



**1. INTRODUCTION**

NewBridge and Mather South are two large planning areas that are in the watershed of the 180± square mile Morrison Creek Stream Group that is tributary to the Beach Stone Lakes (BSL) area. The BSL area is bounded by the Union Pacific Railroad (UPRR), formerly known as the Southern Pacific Railroad on the west, Lambert Road on the south, the Western Pacific Railroad (WPRR) on the east, and Morrison Creek on the north. Point Pleasant is in the southeastern corner of that area (see Figure 1). The BSL area is a part of Stone Lakes National Wildlife Refuge operated by the US Fish and Wildlife Service (USFWS).

The BSL area has a long history of flooding since before the year 1900. The source of this flooding is three-fold:

- a. Runoff that originates within the Morrison Creek Stream Group watershed (consisting of Morrison Creek and its tributaries: Elder, Elk Grove, Florin, Frye, Gerber, Laguna, Strawberry, Todd, Unionhouse, and Whitehouse Creeks),
- b. Precipitation that falls directly upon the Beach Stone Lake area, and
- c. Flood waters that backup from the Cosumnes and Mokelumne Rivers during periods of extreme flooding.

The County of Sacramento (County) has long sought a structural flood relief project to address the flooding problem in the BSL area. After many years of study and analysis, on September 12, 2007, the Sacramento County Board of Supervisors concluded that high costs, the inability to mitigate hydraulic impacts, and other environmental and institutional factors make any structural flood relief project for the BSL/Point Pleasant area infeasible and should no longer be considered. Staff was directed to work with the community to develop a program of non-structural measures.

The measures currently being pursued by the County include purchasing flood insurance for the residents of the BSL/Point Pleasant area, the raising of homes in

the BSL/Point Pleasant area to raise their finish flood elevations above the Base Flood Elevation, and other non-structural flood protection measures. The County also collects a mitigation fee from new development within the Morrison Creek Stream Group watershed to finance these non-structural mitigation measures.

## **2. PROBLEM STATEMENT**

The NewBridge and Mather South developments are currently undergoing environmental review by Sacramento County in conjunction with land use entitlement applications that have been filed by their respective applicants. Notwithstanding the existence of an approved mitigation fee for new developments within the Morrison Creek Stream Group watershed, the extent of additional flooding that may occur within the BSL area during a 100-year/10-day design event because of development of the NewBridge and Mather South developments needs to be determined.

## **3. METHODOLOGY**

The precipitation and runoff characteristics of the NewBridge and Mather South project areas under existing and development conditions were extensively modeled during the preparation of the Drainage Master Plans for each project. The SacCalc precipitation modeling for each project yields the total volume of runoff for both the pre and post development scenarios. The increase in runoff volume from pre to post development is a result of the overall increase in impervious cover that result when a vacant site is developed (i.e., pavement, roof and hardscape areas replacing grass and open space areas).

This increased volume of runoff will be conveyed downstream by the previously mentioned creek system to the BSL area. In lieu of performing detailed modeling for the entire BSL watershed, conservative assumptions can be made to determine the extent of additional flooding that may occur because of development of the NewBridge and Mather South developments.

The primary assumption topics are storm timing and area impacts are described in detail below:

### Watershed Timing

The BSL area drains to the Mokelumne River and, eventually to the Sacramento River much further downstream in the Sacramento River Delta. Accordingly, due to the very flat grades in the area and the extended length of high river stages after major flood events, the BSL area



drains very slowly. Both the NewBridge and Mather South developments are located significantly upstream of the BSL area (approximately 20-miles along the thalweg of the stream). Although there is likely an offset in peaks between the project areas and the BSL area, this analysis will conservatively assume that the volume increase from the projects will occur at the same time as the peak water surface elevation in the BSL area.

#### Area Impacted

Based on the watershed timing assumption, incremental volume of runoff from the two developments will directly add to the depth of flooding in the BSL area during the design event. The depth of additional flooding and the additional flood threat to the residents in the BSL/Point Pleasant area can be determined by dividing the additional volume by the area of flooding in the BSL area. Figure 1 shows the BSL area as well as the 100-year flood plain. It is assumed that the volume increases due to the NewBridge and Mather South projects is only mitigated within the BSL areas. This is also a conservative assumption as the increased volume will be partially mitigated in the creek system as well as the greater 100-year flood plain.

Given these two assumptions any impacts derived in the following analysis are likely very conservative in nature and, in lieu of detailed modeling, would represent a maximum anticipated impact to the BSL area.

## **4. ANALYSIS**

### Runoff Volumes

The results of the SacCalc Modeling contained in the NewBridge and Mather South Storm Drain Master Plans project the total runoff for the pre and post development scenarios. The results of the SacCalc analyses for the two developments is shown in Tables 1 and 2. Tables 1 and 2 also include the incremental difference in runoff volumes for the pre and post development scenarios for the two developments.

### Area of Flooding

The area of inundation within the BSL area during the 100-year flood is shown on an exhibit titled “Beach Stone Lakes/Point Pleasant Flood Preparedness Plan Flood Warning Notification Area” (dated September 21, 2015) prepared by Sacramento County Department of Water Resources. See Figure 1. The area of

flooding used in this analysis is further delimited by the definition of the BSL area described above. The resulting area of flooding is estimated to be 14,257± acres.

**Table 1**  
**NewBridge**  
**Runoff Volumes (Acre-Feet)**  
**100-Year/10-Day Design Event**

Watershed/ Compliance Point	Runoff Volume / Pre- Development	Runoff Volume / Post Development	Runoff Volume Increase
Morrison Creek / CP5	11.7±	12.9±	1.2±
Morrison Creek/ CP12	10.9±	16.0±	5.1±
Frye Creek / CP1	228.3±	321.6±	93.3±
Laguna Creek / CP8	32.1±	40.2±	8.1±
Laguna Creek / CP13	3.9±	5.2±	1.3±
Laguna Creek / CP9	5.5±	7.9±	2.4±
Laguna Creek / CP10	17.9±	17.0±	-0.9±
Laguna Creek / CP11	51.1±	64.7±	13.6±
<b>Total</b>	<b>361.4±</b>	<b>485.5±</b>	<b>124.1±</b>

*Note: Does not include runoff quantities from off-site drainage sheds.*

**Table 2**  
**Mather South**  
**Runoff Volumes (Acre-Feet)**  
**100-Year/10-Day Design Event**

Watershed / Compliance Point	Runoff Volume / Pre- Development	Runoff Volume / Post Development	Runoff Volume Increase
Frye Creek / CP1	25.6±	44.5±	18.9±
Morrison Creek / CP2	9.4±	0±	-9.4±
Morrison Creek / CP3	159.1±	197.8±	38.7±
Morrison Creek / CP4	14.8±	10.1±	-4.7±
Todd Creek / CP5	37.0±	66.1±	29.1±
Todd Creek / CP6	81.6±	166.2±	84.6±
Mather Lake (Morrison Creek) / CP7	33.9±	0±	-33.9±
<b>Total</b>	<b>361.4±</b>	<b>484.7±</b>	<b>123.3±</b>

*Note: Does not include runoff quantities from off-site drainage sheds.*

Increased Depth of Flooding

The resulting incremental increase in depth of flooding in the BSL area for the NewBridge project is determined as follows:

$$\begin{aligned} \text{Depth of Additional Flooding at BSL(NewBridge)} &= \\ 124.1\pm \text{ Acre-Feet} / 14,257\pm \text{ Acres of Flooding} &= 0.0087\pm \text{ Feet.} \\ & \text{(Approx. 1/8"')} \end{aligned}$$

The resulting incremental increase in depth of flooding in the BSL area for the NewBridge project is determined as follows:

$$\begin{aligned} \text{Depth of Additional Flooding at BSL (Mather South)} &= \\ 123.3\pm \text{ Acre-Feet} / 14,257\pm \text{ Acres of Flooding} &= 0.0086\pm \text{ Feet.} \\ & \text{(Approx. 1/8"')} \end{aligned}$$

The cumulative runoff volume increase from both projects is determined as follows:

Runoff Volume Increase for NewBridge =	124.1 Acre-Feet
Runoff Volume Increase for Mather South =	<u>123.3 Acre-Feet</u>
Cumulative Runoff Volume for Both Projects =	247.4 Acre-Feet

The resulting cumulative incremental increase in depth of flooding in the BSL area for both the NewBridge and Mather South projects is determined as follows:

Depth of Additional Flooding at BSL (NewBridge and  
Mather South) = 247.4± Acre-Feet /

14,257± Acres of Flooding = 0.0174± Feet.

(Approx. 1/4")

#### Flooding Impacts

On October 16, 2013, Sacramento County Department of Water Resources (DWR) published an exhibit depicting the Base Flood Elevations and Finish Floor Elevations of the existing structures in the BSL/Point Pleasant area (see Exhibit 2). Exhibit 2 also includes a listing of the depth of flooding for each structure. The Base Flood and finish floor elevations shown on Figure 2, as well as the flood depth are shown to the nearest one-tenth of a foot (0.1 feet).

Of the 121 properties shown on Figure 2, twelve are located south of Lambert Board, which is outside of the BSL Mitigation Fee Area. Of the remaining 109 properties located within the BSL Mitigation Fee area, twenty-four (24) have structures that are labeled "N/A" – presumably because the structures are not habitable. Of the remaining 85 properties only 35 have structures with finish floor elevations above the Base Flood elevation. Only 12 of these 35 properties have structures with finish floor elevations that are equal to or less than 1.1 feet above the Base Flood elevation. The elevation specifics of these twelve structures are shown in Table 3.

The other 50 properties within the BSL area have structures with finish floor elevations that are below the Base Flood elevation. Since these structures are already subject to flooding, the incremental increase in flooding resulting from development of the two projects is deemed to be inconsequential for the purposes of this analysis. While these properties will theoretically see a slight increase in depth of flooding, likely the amount additional flooding will not be discernable to most observers.

**Table 3**  
**Beach Stone Lakes**  
**Critical Structure Elevations (Feet)**

ID	APN	Finish Floor	Base Flood	Freeboard (Flood Depth)
12	132-0120-112	17.9	18.0	-0.0
14	132-0131-010	18.6	18.0	+0.6
22	132-0132-046	19.0	18.0	+1.0
42	132-0230-014	18.1	18.0	+0.1
44	132-0230-029	19.1	18.0	+1.1
51	132-0230-047	19.0	18.0	+1.0
53	132-0230-050	18.5	18.0	+0.4
82	132-0262-010	18.0	18.0	±0.0
93	132-0331-036	18.1	18.0	+0.1
97	132-0332-003	18.8	18.0	+0.8
103	132-0332-013	19.0	18.0	+1.0
104	132-0332-015	18.5	18.0	+0.5

*Note: Roundoff errors appear to have contributed to flood depths that seem to be mathematically incorrect.*

Impacts to Structures

The incremental increase in the depth of flooding in the BSL area that will result from development of the two projects, just less than one-eighth of an inch individually and one-quarter of an inch cumulatively, will have virtually no impact on most of the structures within the BSL because they are already (a) have finish floor elevations substantially above the Base Flood elevation, (b) are subject to flooding, and/or (c) they are presumed not to be habitable structures (“N/A”).

The twelve structures that may be impacted fall into three general categories:

- a. Loss of FEMA Freeboard. Four structures are at risk of having a reduction in freeboard below the standard FEMA criteria of one foot of freeboard to finish floor elevations as shown on Figure 2 (ID 22, 44, 51, and 103).

- b. Freeboard Encroachment. Six structures are at risk of freeboard encroachment as they already have less than one foot of freeboard to finish floor elevations as shown on Figure 2 (ID 14, 42, 53, 93, 97 and 104).
- c. Inundation of Finish Floor. Two structures are at risk of having the finish floor inundated since they show zero depth of flooding on Figure 2 (ID 12 and 82).

It is important to note, as it relates degree of precision of the reported Base Flood and finish floor elevations, the incremental increase in the depth of flooding resulting from the development of these two projects, either individually or cumulatively, is beyond the accuracy of the published Base Flood and finish floor elevation data available for this analysis.

Further, development that has occurred within the Morrison Creek Stream Group watershed since October 2013 has likely increased the depth of flooding within the BSL area. Therefore, it is likely that some of the structures with finish floor elevations above the Base Flood elevation have already seen their freeboard eroded and/or eliminated.

#### Summary

In summary, the above comparison of the depth of existing flooding for each structure to the incremental increase in the depth of flooding that will result from the development of the two projects, either individually or cumulatively, indicate that the incremental depth of flooding from the additional runoff from these two projects will be nominal.

## **5. CONCLUSION**

Based on the analysis presented in this Technical Memorandum it is apparent that the development of the NewBridge and Mather South developments, either individually or cumulatively, will incrementally increase the depth of flooding in the BSL area. However, even using the conservative methodology described above, the increased depth of flooding will be nominal, nearly indiscernible.

Further, the County has adopted a long-range plan to mitigate for the effects of additional flooding within the BSL area. The County has adopted and levied the Beach Stone Lake Flood Volume Mitigation Fee, including periodic updates thereto, for all developing lands within the Morrison Creek Stream Group watershed to generate the funds needed to accomplish the County's goal of

developing non-structural measures to eliminate the flooding problem in the BSL area.

In conclusion, the individual and cumulative effect of additional runoff from the development of the two projects, and the resulting increased depth of flooding in the BSL area is nominal. These impacts, as well as those resulting from continued development in the Morrison Creek Stream Group watershed, as it relates to increased flooding in the BSL area, while probably significant, is being adequately mitigated by the adopted Beach Stone Lake Flood Volume Mitigation Fee program. Both the NewBridge and the Mather South developments, when approved, will participate in the Beach Stone Lake Flood Volume Mitigation Fee program and be subject to the fee at the time of development.

## **6. REFERENCES**

The following documents were used as reference materials in the preparation of this Technical Memorandum:

- a. Beach Stone Lakes/Point Pleasant Flood Preparedness Plan Flood Warning Notification Area, September 21, 2015 (Sacramento County Department of Water Resources).
- b. Beach-Stone Lakes Properties Floor Elevations, October 16, 2013 (Sacramento County Department of Water Resources).
- c. Board of Directors Sacramento County Water Agency, September 12, 2007, "Continue to Use the Accrued Interest Generated from SCWA Fund 314A-Beach Stone Lake Flood Mitigation Fund...".
- d. Storm Drainage Master Plan for NewBridge (Including Errata), April 2017 (MacKay & Somps Civil Engineers).
- e. Storm Drainage Master Plan for Mather South, November 2017 (MacKay & Somps Civil Engineers).
- f. Zones 11A, 11B, and 11C Engineer's Report for Formation, January 9, 1996 (Sacramento County Water Agency).
- g. Zones 11A, 11B, and 11C Engineer's Report for Fee Plan Update, August 16, 2004 (Sacramento County Water Agency).
- h. Zones 11A, 11B, and 11C Engineer's Report for Fee Plan Update, April 14, 2015 (Sacramento County Water Agency).



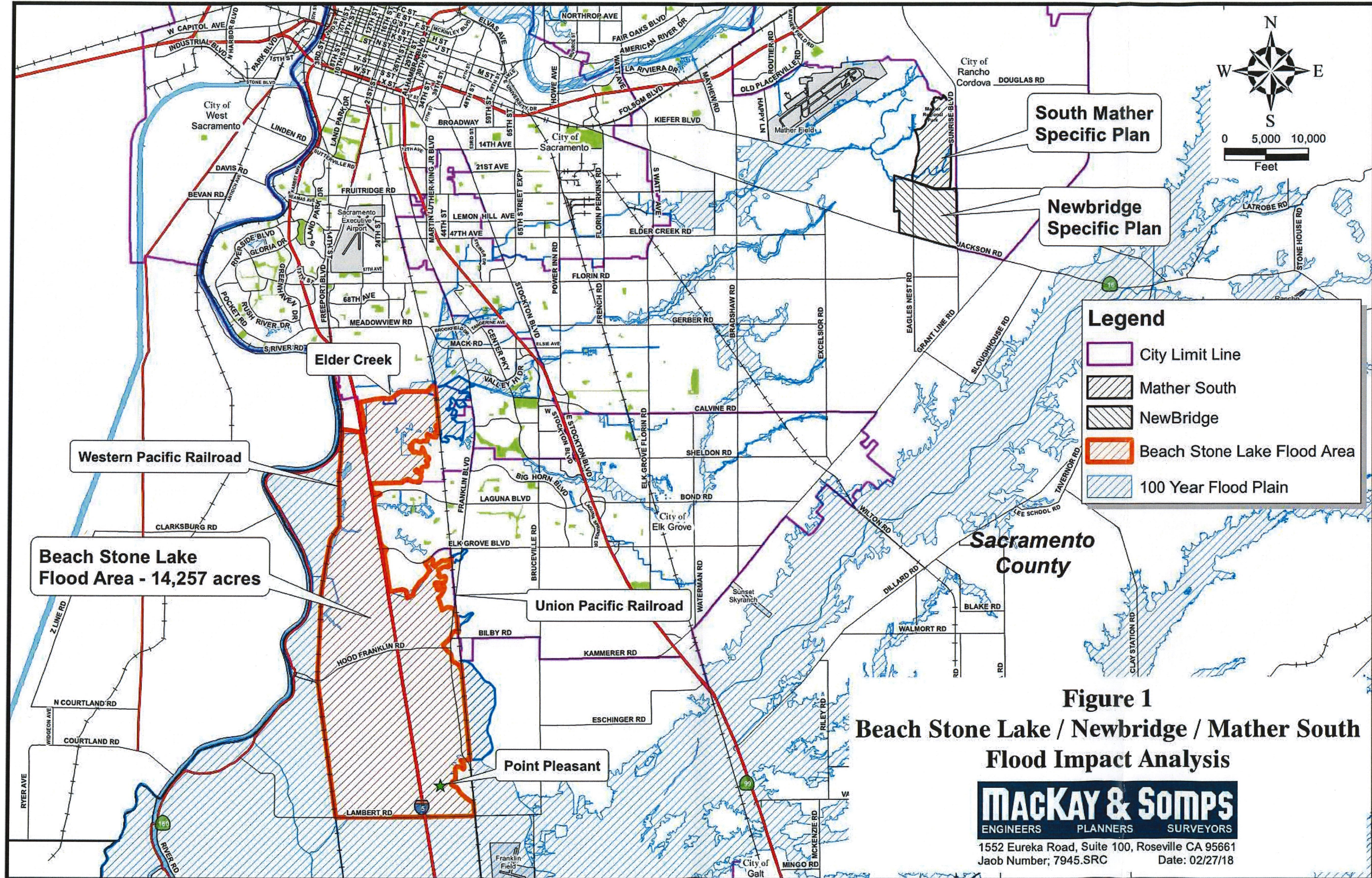


Figure 1



