Attachment 4

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

FLOODWAY REPORT

FOR THE

1328 BERRY STREET IMPROVEMENTS

IN

THE NAPA RIVER FLOODWAY

LOCATED AT

1328 BERRY STREET
CALISTOGA, CA 94515
COUNTY: NAPA
APN: 011-222-001

SEPTEMBER 6, 2013

PREPARED FOR REVIEW BY:

CITY OF CALISTOGA
1232 WASHINGTON STREET
CALISTOGA, CA 94515

1104 ADAMS STREET, SUITE 203, ST. HELENA, CALIFORNIA 94574
707-963-8456 TELE + WWW.DELTACIVIL.COM 707-963-8528 FAX

TABLE OF CONTENTS

I.INTRODUCTION & PURPOSE - 1 -
A. INTRODUCTION - 1 -
B. GOALS & OBJECTIVES - 1 -
C. BACKGROUND - 1 -
II. HYDROLOGIC MODEL DEVELOPMENT - 3 -
III. CONCLUSION - 6 -
IV. APPENDIX - 7 -
A. Appendix A: Summary of Results
B. Appendix B: Currently Effective Model Information
C .Appendix C: Duplicate Effective Model Information
D. Appendix D: Existing Conditions Model Information
E. Appendix E: Proposed Conditions Model Information
F. Appendix F: Vicinity Map, Annotated FIRM, Site Maps
G. Appendix G: Existing Topographic Map, Architectural Plans

I. INTRODUCTION & PURPOSE

A. INTRODUCTION

The subject parcel is located at 1328 Berry Street, Calistoga, CA, also known as Napa County Assessor's parcel number 011-222-001. The parcel is located within the Federal Emergency Management Agency (FEMA) defined 'floodway' of the Napa River. The property owners wish to reconstruct a residential structure on the property, and are required to provide evidence that the improvements will have no net effect on the floodway.

B. GOALS & OBJECTIVES

Delta Consulting & Engineering (DCE) was commissioned to evaluate the impacts that the structures additional footprint and remodeling may have on the floodway. This report describes the methodology, history of creek flood studies, subsequent findings from the evaluation of the additional structures or massing in the floodway, and their impact to the flood event water surface elevations.

C. BACKGROUND

1. Federal Emergency Management Agency (FEMA)

   a. Flood Mapping: Napa River
   For the subject area and Napa River, the current Flood Insurance Rate Map (FIRM) Map Number is 06055C0229E with an effective date of September 26, 2008. The Flood Insurance Study (FIS) for Napa County, California dated September 26, 2008, for the City of Calistoga in Napa County, including Napa River, states the following on page 1:

   > "the hydrologic and hydraulic analysis from the FIS report dated March 28, 1979, were performed by Dames & Moore, for the Federal Insurance Administration (FIA), under Contract No. H-3952. That work, which was completed in June 1977, covered all significant flooding sources affecting the City of Calistoga."

   The extent of the floodway and the base flood elevations shown in the current FIS and FIRM for the subject parcel are based on the Dames & Moore study completed in 1977. The associated flood model is dated March 18, 1972. Based on information contained in the FIS dated March 28, 1979, the flood mapping of Napa River in the City of Calistoga was based on United States Geological Survey 7.5 minute quadrangle maps with a contour interval of 20 feet[1]. The extent of the floodway was computed at 83 locations along Napa River[2]. In between the cross sections, the floodway extent was interpolated[3].

   The Napa River cross sections relevant to the project were located at the following locations (locations are given in feet upstream of the county limits):

BV	222,674 feet
BW	223,624 feet
BX	223,744 feet

   Section BX is located immediately downstream of the downstream face of the Berry Street Bridge, adjacent to the subject parcel.

   No other flood mapping has been reviewed and published by FEMA in a FIS for Napa River near

[1] FIS, Napa County, September 28, 2008, Section 4.1, Page 22
[2] FIS, Napa County, September 28, 2008, Table 8, 'Napa River'.
[3] FIS, Napa County, September 28, 2008, Section 4.2, Page 24.

the location of 1328 Berry Street in the City of Calistoga.

DCE obtained an electronic model of the cross sections used to model the Napa River from the County of Napa. The City of Calistoga provided DCE with a paper model of the geometric cross section input and the HEC-2 model output for the portion of the Napa River around the subject parcel. The information provided by the City of Calistoga was used to validate the electronic model provided by the County of Napa.

b. Flood Discharges
Section 3.0 of the FIS discussed the methods used to determine the peak discharges of various rivers and creeks studied. "All computed approximately 1-percent annual chance discharges were calculated using rainfall-run-off curves in conjunction with topographic maps (U.S. Department of the Interior, 1958 et cetera), which were used to determine drainage areas and cross-section data."[4] Unfortunately, the FIS does not list the calculated flood discharge for Napa River at the location of the subject parcel.

Flood discharge information was obtained from the HEC-2 output file provided by the City of Calistoga, and validated through Table 8 of the September 26, 2008 FIS, which shows flow velocity and flow area for cross sections BV, BW, and BX, which bound the subject parcel. The 1-percent annual chance discharge used in the hydraulic analysis is 9,600 cubic feet per second (cfs).

c. Napa River: Base Flood Elevations
The current FIS lists the base flood elevations according to the North American Vertical Datum 1988 (NAVD88). The base flood elevations (356.1 feet, 356.0 feet, and 350.5 feet) are given in NAVD88 on the FIRM. The information provided in the currently effective model was not on the NAVD88 datum. The original study was based on the National Geodetic Vertical Datum of 1929. Additionally, a value of 50 was added to all elevations to ensure none of the output results were negative.

Note: Per the FIS, the conversion from NAVD 88 to NGVD29 is to subtract 2.78 feet[5] from the NAVD88 elevation. This is the conversion value used in DCE's analysis.

Elevations in DCE's analysis are based on values provided in the HEC-2 input and output data. The results of the analysis were then converted to elevations on the NAVD 88 datum.

2. Subject Parcel

a. Existing Structures
Existing structures on the property include an existing duplex unit and an existing house. These structures were not included in any FIS study, as it is common practice to compensate for flow blockage in urban areas by increasing the Manning's Roughness Coefficients. For this study, the existing structures on the property will be accounted for in the existing conditions section of the hydraulic analysis. See the existing conditions site map in Appendix F depicting the finished floor elevations and locations of floodway blockages relative to FIS cross sections and floodway boundaries.

[4] FIS, Napa County, September 28, 2008, Section 3.1, Page 10.
[5] FIS, Napa County, September 28, 2008, Section 3.3, Page 21.

b. Proposed Structures
The owners of the subject parcel propose to reconstruct the existing house and build a covered carport. The reconstruction of the existing house slightly expands upon the original footprint. As a preliminary measure to mitigate any impacts on the floodway, the building is proposed to be constructed on raised piers, allowing flood waters to pass underneath the structure in a flood event. The building will be modeled to reflect the new footprint and raised floor construction. The proposed carport will consist of a roof constructed on square wooden posts. As no floodway blockages are proposed for the carport, it will not be considered in the hydraulic analysis. See the proposed conditions site map in Appendix F depicting the finished floor elevations and locations of floodway blockages relative to FIS cross sections and floodway boundaries.

c. City of Calistoga Code, Section 18.24: Floodplain Management Guidelines
City of Calistoga Code for Floodplain Management states that a Floodplain Management Permit is required to be issued by the local Floodplain Administrator when structures are requested to be constructed in the floodway. As the subject parcel is located within the FEMA defined floodway, Section 18.24.020 of the City of Calistoga Code applies to those requesting a variance to build in the floodway. This section of code describes and outlines that the City Council shall consider all technical evaluations prior to the floodplain permit being issued by the floodplain administrator.

In order to satisfy City of Calistoga Code Section 18.24 for issuance of variance for construction in the floodway, DCE has completed hydrologic modeling of the pertinent section of Napa River in the vicinity of the subject parcel to support the request for building permits.

3. Hydrologic Modeling

The river/flood modeling standard software is HEC-RAS (Hydrologic Engineering Centers River Analysis System, version 4.0) is the industry standard river analysis software used to prepare flood modeling and its use is acceptable to FEMA. Based on City of Calistoga requirements, DCE was instructed to prepare a HEC-RAS model to determine whether the additional construction and/or modifications to the existing structures cause any increase in the upstream flood water elevations. To be consistent with Floodplain Management Guidelines, the model results 'shall not result in any increase in the base flood elevation'.

II. HYDROLOGIC MODEL DEVELOPMENT

1. Napa River

DCE obtained the original Napa River cross section model in paper form from the City of Calistoga, and an electronic version of the cross sections from Napa County Public Works. In the City of Calistoga, the original flood model was developed by Dames & Moore for the Napa River and is dated 1976. See Appendix B for the currently effective model input and output files. The locations of cross sections are shown on the FIRM panel.

The Napa River paper model lists the distance between the cross sections. Additionally, the Napa County FIS provides a flood profile for Napa River that shows distances upstream from its confluence with the Napa River. The flood profile shows cross section BX near the Berry Street Bridge, at a distance of 223,744 feet upstream from Napa River's confluence with the Napa County Line. DCE went through the paper model of Napa River, and determined that cross section 2702 was located at the downstream face of the Berry Street Bridge. Additionally, the FIRM shows FIS cross section BX at the same location. Cross section 2702 was used as the upstream starting point for developing the flood model, as it is immediately upstream of the project site. DCE used cross section 2702 as a base marker to build the rest of the cross section location map. By placing cross section 2702 just

downstream of the Berry Street Bridge, DCE continued to use cross section information from the Napa River paper model to add two additional downstream cross sections to the hydraulic model. Cross sections 2700 and 2690 were added to the hydraulic model based on the spacing distances given in the paper model.

Based on the location of cross sections 2702, 2700, and 2690, DCE added cross sections through the site based on a topographic survey provided by Albion Surveys, Inc. The topographic map provided by Albion was set to NAVD88, and can be seen in Appendix G. Cross section 2702 was placed just downstream of the Berry Street Bridge. Based on the hydraulic model, cross section 2700 is 90 feet downstream of 2702 and was drawn as such. These two cross sections bound the existing duplex unit on the property.

Because the proposed residential unit is to be reconstructed in a similar footprint as the existing building, cross sections were placed through the upstream and downstream portions of this unit. The distance between these cross sections was determined based off of the topographic survey, and input to the HEC-RAS geometry editor.

To develop cross section elevation information to be used in HEC-RAS, DCE used the currently effective data, and interpolated between known cross sections. Interpolation between cross sections 2700 and 2690 was used to obtain cross section elevation information in the location of the existing residential unit that is to be re-constructed. Blockages due to the existing and proposed structures were placed in the hydraulic model based on the distance from the top of bank, as shown in the survey data. See the existing and proposed site maps in Appendix F for detail on cross section location and floodway blockage.

a. Duplicate Effective
The cross sections elevations from the original 1977 model uses were:

	Water Surface Elevation (ft)	
Cross Section #	HEC Model	NAVD 88
2702	403.15	355.93
2700	403.16	355.94
2690	398.68	351.46

For purposes of simplicity, DCE completed all analysis based on the elevations given in the paper model, then converted all elevation results from the 1972 paper model to NAVD88.

These three cross sections were input into HEC-RAS and evaluated to note their change in water surface elevation from the 1972 Nolte analysis. This model run is named "Duplicate Effective". Initial HEC-RAS analysis using the original FIS data and HEC-2 computational methods yielded results within .1 feet of the original FIS hydraulic model. Please see Appendix A for a summary of results.

b. Existing Conditions
After the Duplicate Effective model was run and the water surface elevations noted, two cross sections were added to the Duplicate Effective model. To depict the existing structure on the property, the following cross sections were added:

Cross Section #	Description
2699.88*	Through upstream face of building
2699.44*	Through downstream face of building

The addition of blockages in the "Existing Conditions" model caused a rise in the water surface elevation at cross sections 2702 and 2700. Because the increase in water surface elevation at each cross section was less than 0.5 feet, no revisions are required to be made to the existing flood maps, and the existing conditions model is deemed as acceptable for comparison to the proposed conditions model. The water surface elevations for the existing conditions model can be seen in Appendix A. These water surface elevations must not be exceeded by the proposed conditions model in order to gain approval for a floodway variance in the City of Calistoga.

c. Proposed Conditions

After the Existing Conditions model was run and the water surface elevations noted, cross sections were modified from the Existing Conditions model to represent the changes that were to be made to the proposed residence on the subject parcel.

Cross Section #	Description
2699.88*	Changed the blockage type to reflect raised floor construction
2699.44*	Changed the blockage type to reflect raised floor construction

These cross sections in the proposed conditions model represent the new building extents and revised foundation type. It was assumed that the bottom of the raised floor's structure was set at the base flood elevation, allowing flood water to enter the pier foundation area and crawl space. The width of piers where considered in the model, and the space between the piers was modeled as ineffective flow area due to the proposed lattice screening between piers. The ineffective flow area denotes the space between piers as being able to store flood water volume, but not being able to pass flood flow through at a high velocity. This model's water surface elevations must not exceed those of the "Existing Conditions" in order to meet Floodplain Management Guidelines.

Because of the proposed raised floor construction, the water surface elevation was reduced from the existing conditions model. With the proposed construction, flood waters will be given more area to spread out, and therefore decrease the height of flood flow. A summary of the water surface elevations can be seen in Appendix A.

III. CONCLUSION

This report outlined the background of Napa River flood modeling, electronic modeling methodology, sources for developing existing and proposed site conditions, and demonstrated that the proposed reconstruction of a residential structure on the subject parcel will result in zero increase to floodwaters within and adjacent to the subject parcel. All technical data supporting the No-Rise/No-Impact finding in this report can be seen in the Appendices that follow this conclusion.

IV. APPENDIX

Appendix A:	Summary of Results
Appendix B:	Currently Effective Model Information
Appendix C	Duplicate Effective Model Information
Appendix D:	Existing Conditions Model Information
Appendix E:	Proposed Conditions Model Information
Appendix F:	Vicinity Map, Annotated FIRM, Site Maps
Appendix G:	Existing Topographic Map, Architectural Plans

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

APPENDIX A

SUMMARY OF RESULTS
HYDRAULIC ANALYSIS

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

Floodway Study

County:	Napa
River or Creek:	Napa River
Location:	Berry Street Bridge
	~42.4 miles upstream of Napa River/County Line Junction
Site Address:	1328 Berry Street, Calistoga, CA
APN:	011-222-001
River Modeling Software:	HEC-RAS 4.1
Vertical Datum:	NAVD 88

^Red value indicates the a rise in flood water elevation^

	RIVER CROSS SECTION								
	2702 (Original)			2700 (Original)			2699.88* (Additional)		
Electronic Plan File Name	W.S.E.		Δ_{WSEL}	W.S.E.		Δ_{WSEL}	W.S.E.		Δ_{WSEL}
Current Effective (1972 FEMA Analysis)	355.93			355.94					
Duplicate Effective	355.93		0.00	355.95		0.01			
Existing Conditions	356.11		0.18	356.1		0.15	356.01		
Proposed Conditions	356.04		0.07	356.03		0.07	355.96		0.05

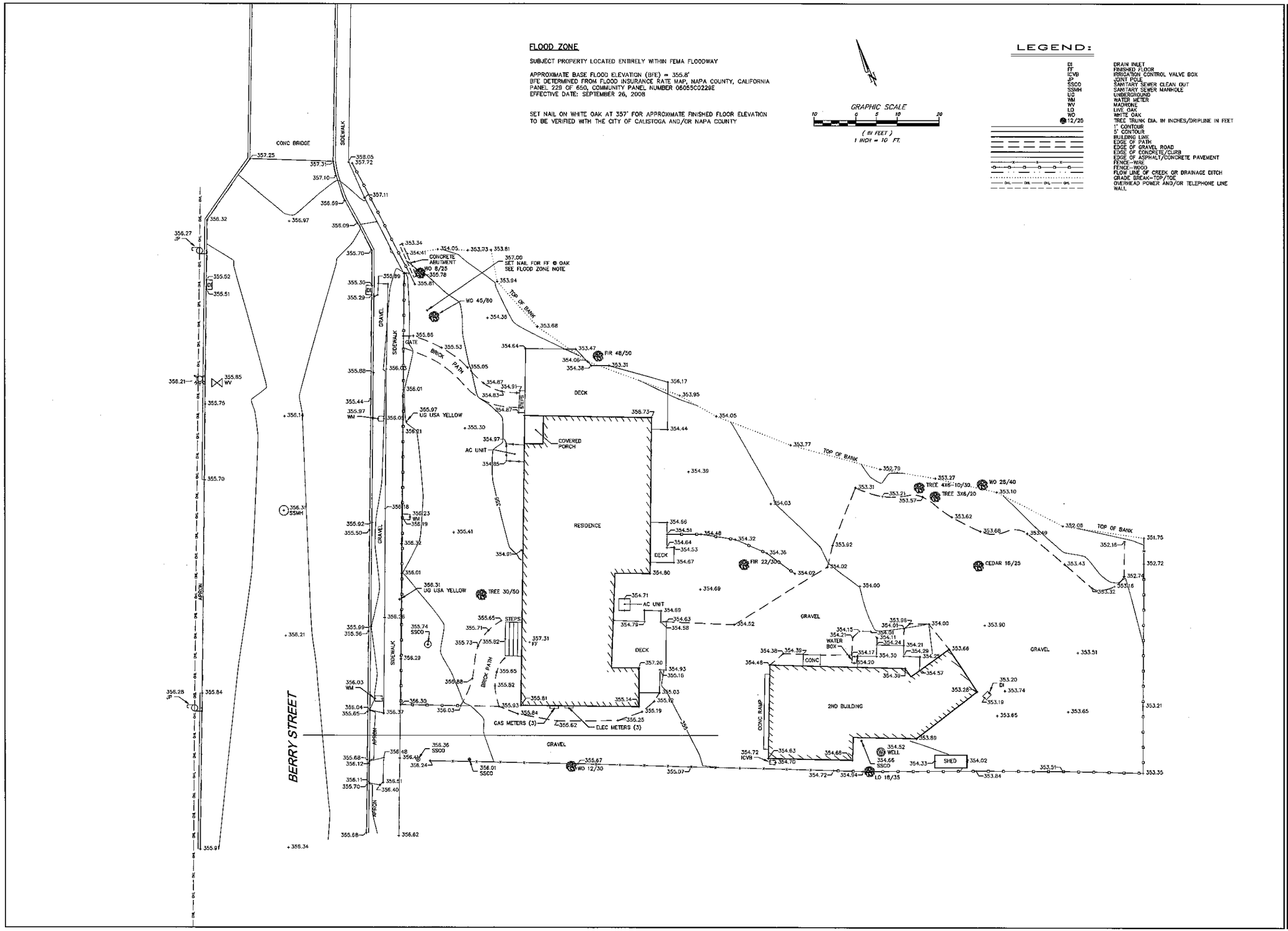
	RIVER CROSS SECTION								
	2699.44* (Additional)			2960 (Original)					
Electronic Plan File Name	W.S.E.		Δ_{WSEL}	W.S.E.		Δ_{WSEL}	W.S.E.		Δ_{WSEL}
Current Effective (1972 FEMA Analysis)	355.94			351.46					
Duplicate Effective	355.95		0.01	351.46		0.00			
Existing Conditions	355.9		0.05	351.46		0.00			
Proposed Conditions	355.88		0.02	351.46		0.00			

Table Notes: W.S.E results for the Current Effective and Duplicate Effective must be within 0.1 feet
W.S.E results for the Duplicate Effective and Existing conditions must be within 0.5 feet
W.S.E results for the Proposed Conditions must be equal to or less than the Existing Conditior

1104 ADAMS STREET, SUITE 203
ST. HELENA, CALIFORNIA 94574
TELE 707-963-8456 + FAX 707-963-8528

APPENDIX G

EXISTING TOPOGRAPHY MAP
ARCHITECTURAL PLANS



ALBION

ALBION SURVEYS, INC.
CONSULTING LAND SURVEYORS
1113 HUNT AVENUE
ST. HELENA, CA 94574
(707) 963-1217
FAX (707) 963-1829

DRAWING NOTES

THIS MAP IS NOT A BOUNDARY SURVEY.
IT IS PROVIDED TO LOCATE THE PROPOSED SUBJECT PROPERTY IN RELATION TO ADJOINING LANDS, HIGHWAYS, ROADS, STREETS AND NOT TO GUARANTEE ANY FIXED DIMENSION OR ACREAGE.
A FIELD SURVEY SHOULD BE PERFORMED PRIOR TO ANY CRITICAL DESIGN WORK, CONSTRUCTION OR CONVEYANCE. EASEMENTS MAY AFFECT THIS PROPERTY.
THIS SURVEYOR WAS NOT PROVIDED ANY INFORMATION REGARDING EASEMENTS BY THE OWNER.

SITE INFORMATION

APN: 011-222-001
ADDRESS: 1328 BERRY ST.
CALISTOGA, CA 94515

MAP OF TOPOGRAPHY
OF THE LANDS OF
LESTRANGE & POGGI-LESTANGE
COUNTY OF NAPA STATE OF CALIFORNIA

REVISIONS & ADDITIONS

DATE: 5-17-13 DRAFTER: S. STEWART	FB: 698	PG: 81-87
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:

ALBION REFERENCES

PROJECT NO: 3410
ASSOCIATED DWG(S):
PROJECT MANAGER: J. WEBB
DATE OF SURVEY: MAY, 2013

CONTOUR INTERVAL = 1'

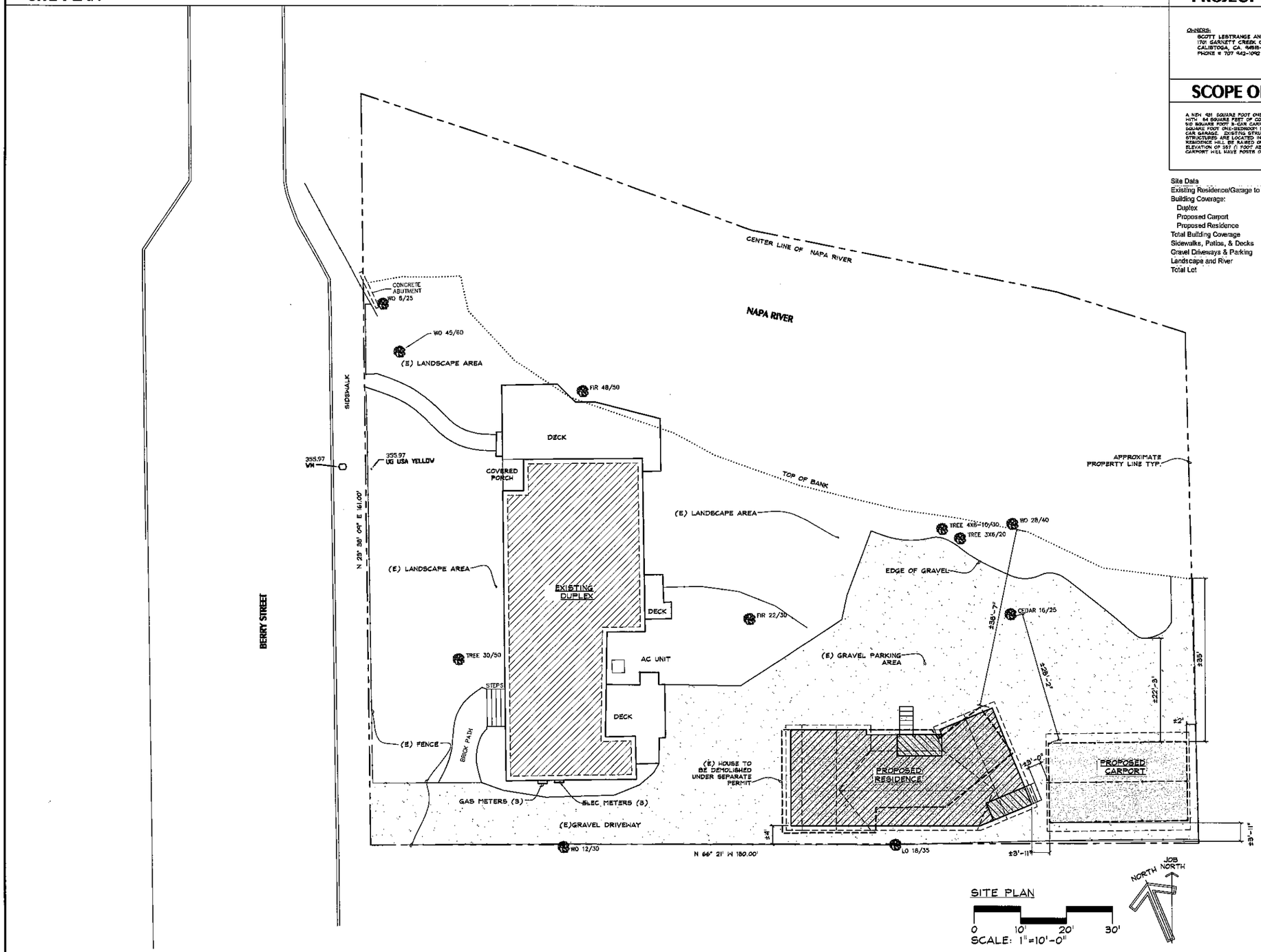
VERTICAL DATUM BASED ON NAVD'88
NAPA COUNTY BENCHMARK 503-U
EL=361.502 NGVD29 +2.89 TO NAVD88

HORIZONTAL DATUM BASED ON NAD83

SHEET 1 OF 1
CSD PROJECT 3410
3410-TOPO.dwg

Attachment 4

SITE PLAN



PROJECT OWNER

OWNERS:
SCOTT LESTRANGE AND LINDA M. POGGI/LESTRANGE
1701 GARNETT CREEK COURT
CALISTOGA, CA. 94515-1011
PHONE # 707 942-1092 (HOME)

SCOPE OF WORK

A NEW 931 SQUARE FOOT ONE-BEDROOM SINGLE FAMILY DWELLING WITH 64 SQUARE FEET OF COVERED PORCHES AND NEW DETACHED 510 SQUARE FOOT 2-CAR CARPORT TO REPLACE THE EXISTING 867 SQUARE FOOT ONE-BEDROOM SINGLE FAMILY DWELLING WITH SINGLE CAR GARAGE. (E) EXISTING STRUCTURES AND ACCESSORY STRUCTURES TO BE DEMOLISHED UNDER SEPARATE PERMIT. THE NEW RESIDENCE WILL BE RAISED ON PIERS AND HAVE A FLOOR ELEVATION OF 357.1 FEET ABOVE MEAN SEA LEVEL. THE NEW CARPORT WILL HAVE POSTS ONLY AND A GRAVEL FLOOR.

Site Data

Existing Residence/Garage to be removed:	875 sq. ft.	
Building Coverage:		
Duplex	1852 sq. ft.	
Proposed Carport	510 sq. ft.	
Proposed Residence	931 sq. ft.	
Total Building Coverage	3293 sq. ft.	13.5% Lot Coverage
Sidewalks, Patios, & Decks	1105 sq. ft.	4.5% Lot Coverage
Gravel Driveways & Parking	5008 sq. ft.	20.5% Lot Coverage
Landscape and River	14991 sq. ft.	61.4% Lot Coverage
Total Lot	24397 sq. ft.	100% Lot Coverage

ARCHITECT:
MARY SIKES & ASSOC.
1461 RAILROAD AVE. #200
ST. HELENA, CA 94574
VOICE 707.963-8063 FAX 707.963-1066

PROJECT ENGINEER:
VAL PIZZINI, ENG.
1400 GUERNEVILLE RD., STE. 12
SANTA ROSA, CA. 95403
VOICE 707.527-9802 FAX 707.527-9801

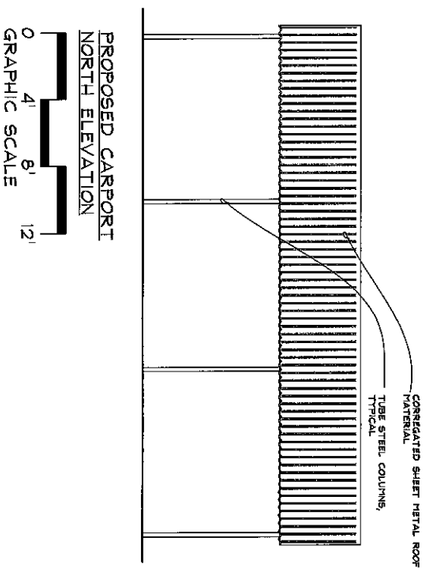
DATE:
09/05/2013
Drawn by: LAB

SHEET DESCRIPTION:
SITE PLAN
DESCRIPTION OF WORK

SITE LOCATION:
A.P.N.: 011-222-001
1328 BERRY STREET
Calistoga, CA

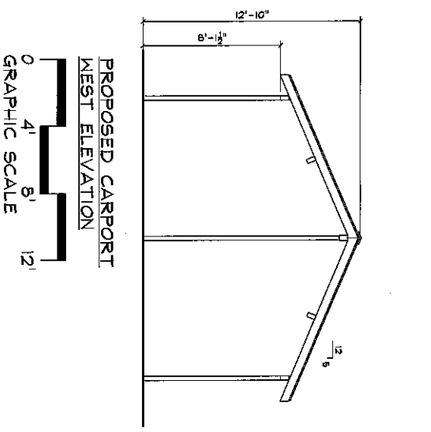
PROJECT:
LESTRANGE
VARIANCE

SHEET NUMBER:
1.0



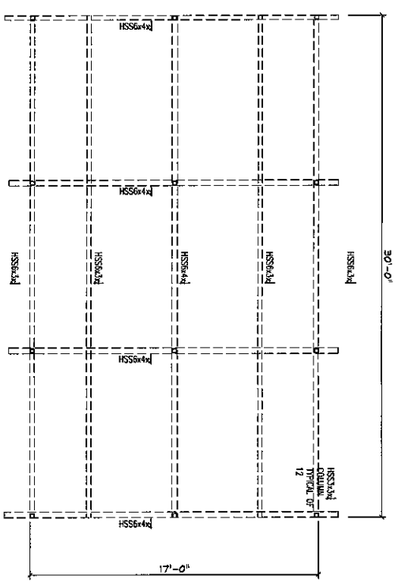
PROPOSED CARPORT
NORTH ELEVATION

0 4' 8' 12'
GRAPHIC SCALE

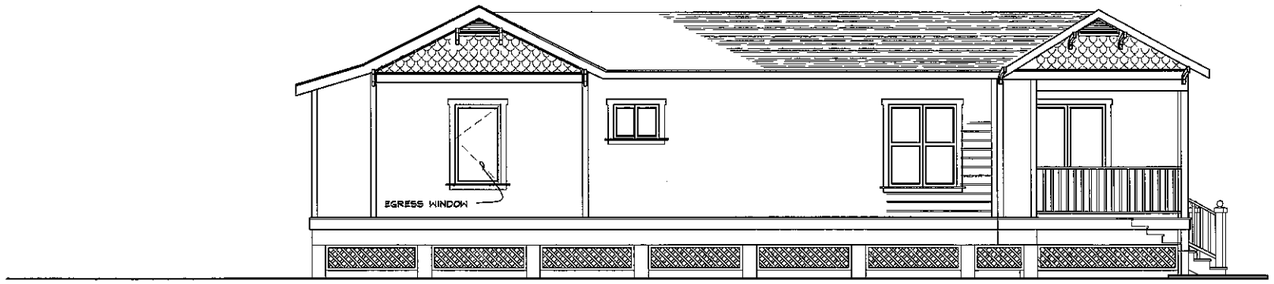


PROPOSED CARPORT
WEST ELEVATION

0 4' 8' 12'
GRAPHIC SCALE

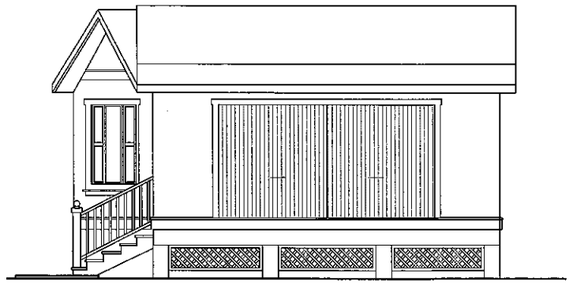


SHEET NUMBER:	PROJECT:	SITE LOCATION:	SHEET DESCRIPTION:	DATE:	PROJECT ENGINEER	ARCHITECT:
3.0	LESTRANGE VARIANCE	A.P.N.: 011-222-001 1328 BERRY STREET Calistoga, CA	GARAGE FLOOR PLAN ELEVATIONS SCHEDULES	09/03/2013 Drawn by: LAB	VAL PIZZINI, ENG. 1400 GUERNEVILLE RD., STE. 12 SANTA ROSA, CA. 95403 VOICE 707.527-9802 FAX 707.527-9801	MARY SIKES & ASSOC. 1461 RAILROAD AVE. #200 ST. HELENA, CA 94574 VOICE 707.963-8063 FAX 707.963-1066



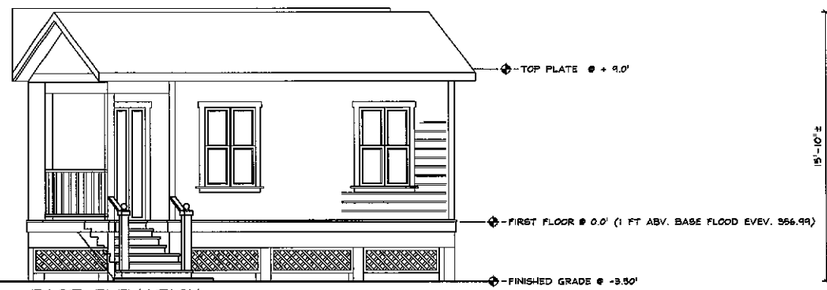
SOUTH ELEVATION

0 4' 8' 12'
GRAPHIC SCALE



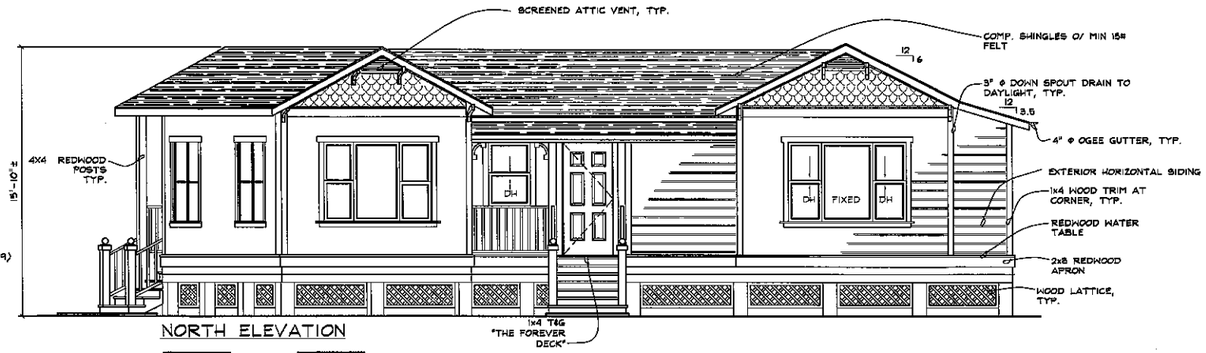
WEST ELEVATION

0 4' 8' 12'
GRAPHIC SCALE



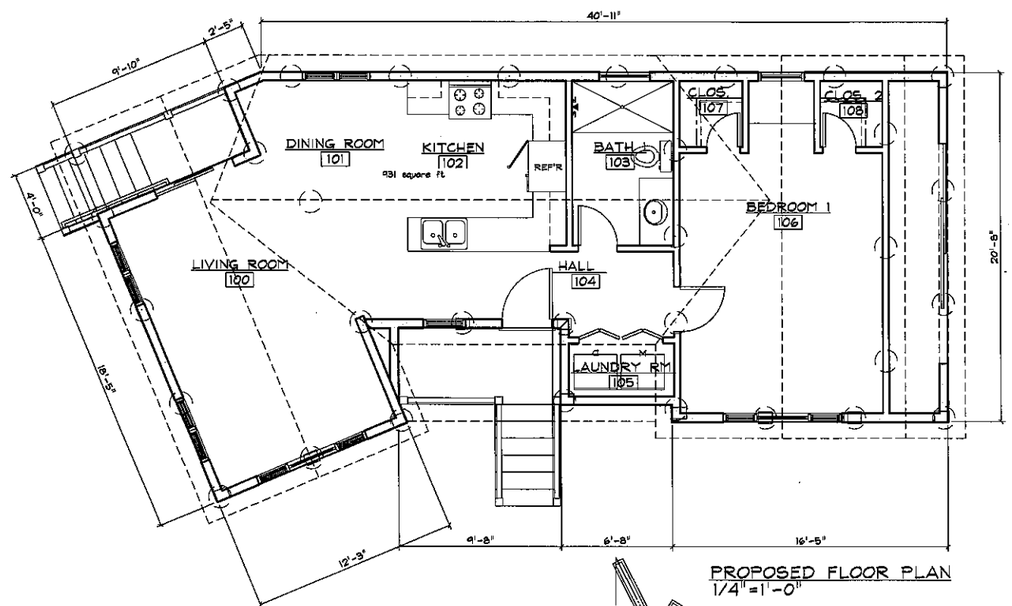
EAST ELEVATION

0 4' 8' 12'
GRAPHIC SCALE



NORTH ELEVATION

0 4' 8' 12'
GRAPHIC SCALE



PROPOSED FLOOR PLAN
1/4"=1'-0"

0 4' 8' 12'
GRAPHIC SCALE

ARCHITECT:
MARY SIKES & ASSOC.
1461 RAILROAD AVE. #200
ST. HELENA, CA 94574
VOICE 707.963-8063 FAX 707.963-1066

PROJECT ENGINEER:
VAL PIZZINI, ENG.
1400 GUERNEVILLE RD., STE. 12
SANTA ROSA, CA. 95403
VOICE 707.527-9802 FAX 707.527-9801

DATE:
04/03/2013

Drawn by: LAB

SHEET DESCRIPTION:
GARAGE FLOOR PLAN
ELEVATIONS
SCHEDULES

SITE LOCATION:
A.P.N.: 011-222-001
1328 BERRY STREET
Calistoga, CA

PROJECT:
LESTRANGE
VARIANCE

SHEET NUMBER:
2.0