APPENDICES

for

ADDENDUM TO INITIAL STUDY/ MITIGATED NEGATIVE DECLARATION

2400 Grant Street Subdivision Project

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Appendix A.

LAND EVALUATION AND SITE ASSESSMENT

Land Evaluation and Site Assessment prepared by M-Group on June 12, 2024.

LAND EVALUATION AND SITE ASSESSMENT

2400 Grant St., Calistoga, CA 94515

June 12, 2024

PREPARED BY M-GROUP FOR:
THE CITY OF CALISTOGA
PLANNING AND BUILDING DEPARTMENT
1232 WASHINGTON STREET
CALISTOGA, CA 94515

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1. INTRODUCTION

The Land Evaluation and Site Assessment (LESA) model is an approach for rating the relative quality of agricultural land resources based upon specific measurable features. The LESA model was first developed by the federal Natural Resources Conservation Service (NRCS) in 1981. It was subsequently adapted in 1990 by the California Department of Conservation to evaluate land use decisions that affect the conversion of agriculture lands in California. The formulation of the California LESA Model is intended to provide lead agencies under the California Environmental Quality Act (CEQA) with an optional methodology to ensure that significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environmental review process.

For determining the potential CEQA significance resulting from the conversion of agricultural lands to some other purpose, the California Agricultural LESA Model has developed Scoring Thresholds which are used to compare the Final LESA Score and the Weighted Factor Scores for the Project with suggested Scoring Decisions. These LESA Scores do not take into consideration any proposed mitigation measures or other factors that might affect a lead agency's determination of the significance of the agricultural lands conversion impact under CEQA.

The information provided on the following pages present documentation of the LESA assessment prepared using the California Agricultural LESA Model for the conversion of an existing vineyard on one parcel (APN 011-010-057) totaling 17.96 acres at 2400 Grant St. in Calistoga to a 19 lot residential subdivision for 17 single family residences.

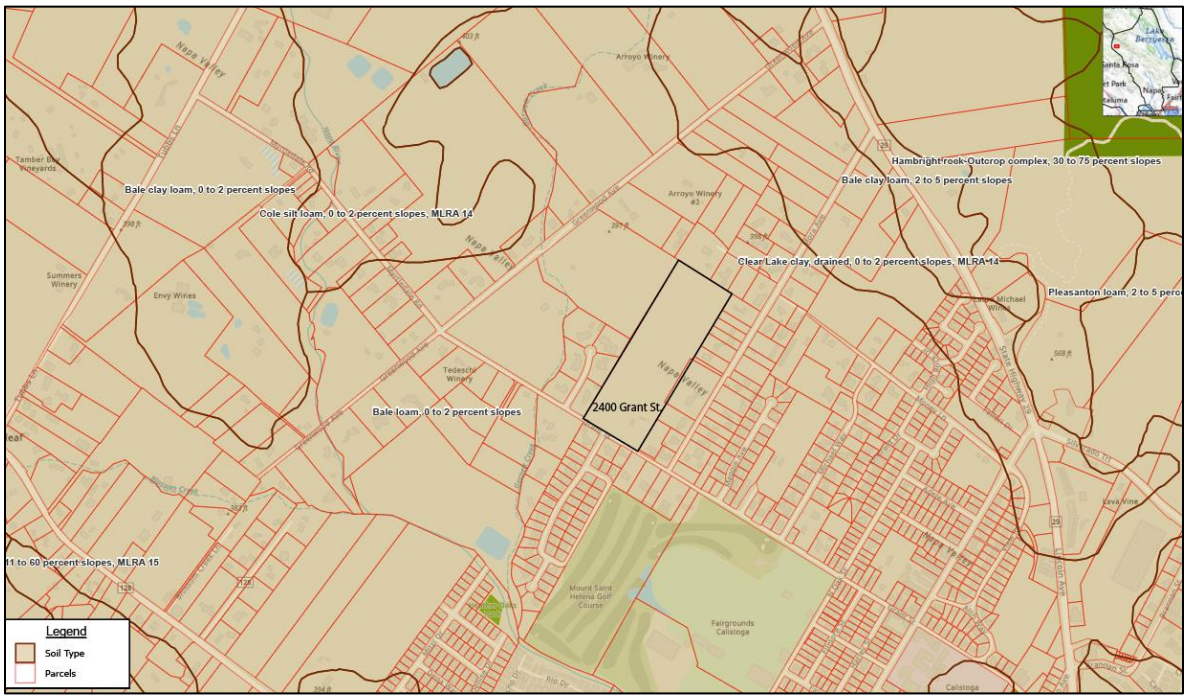
2. LESA EVALUATION

For purposes of this evaluation, the 2400 Grant Street Subdivision in Calistoga, CA constitutes the Project. The 17.96-acre project site was evaluated using the LESA Model to rate the quality and availability of agricultural resources onsite and in the immediate vicinity. The Model was also used to identify whether the proposed project would exceed the threshold criteria established to determine whether a significant impact to Agricultural Resources would occur under CEQA. There are two major components to the LESA Model: 1) The Land Evaluation and 2) The Site Assessment, which are weighted equally. The factors that comprise these components are evaluated in the following sections.

Land Evaluation

The Land Evaluation portion of the LESA Model focuses on two main components that are separately rated, the Land Capability Classification Rating, and the Storie Index Rating. In order to perform the Land Evaluation, the soil map units for the entire project site are identified. Figure 1: Soil Map illustrates the soil types present on the site.

Figure 1: 2400 Grant St. Project Site Soil Map



Land Capability Classification (LCC) Rating

The Land Capability Classification (LCC) Rating indicates the suitability of soils for most kinds of crops. Groupings are made according to the limitations of the soils when used to grow crops, and the risk of damage to soils when they are used in agriculture. Soils are rated from Class 1 to Class 8, with soils having the fewest limitations receiving the highest rating (Class 1). Specific subclasses are also utilized to further characterize soils. **Table 1** illustrates the numeric score for each mapping unit and the conversion to point ratings for each LCC.

Table 1: Numeric Conversion of Land Capability Classification Units

Land Capability Classification	LCC Point Rating
1	100
2e	90
2s, 2w	80
3e	70
3s, 3w	60
4e	50
4s, 4w	40
5	30
6	20

7	10
8	0

The site contains soil identified as 103 - Bale loam, 0 to 2 percent slope, with Bale being 85 percent of the component soil. Under the Land Capability Classification system, the specific classification is 3w (non-irrigated) and 2w (irrigated) per the USDA Websoil Map and Report for the site.[1] **Table 2** shows the Land Capability Classification and LCC Point Rating for the soil located at 2400 Grant St. in Calistoga, CA which is not irrigated.

Table 2: Land Capability Classification

Map Unit Symbol and Name		Land Capability Classification	
	Status	LCC Subclass	LCC Point rating
103 - Bale Loam, 0-2 % slopes	**Non-Irrigated**	3w	60
California Agricultural Land Evaluation and Site Assessment (LESA) Model Instruction Manual. Prepared by the California Department of Conservation, Office of Land Conservation, 1997.			

Storie Index Rating

The Storie Index Rating provides a numeric rating (based upon a 100 point scale) of the relative degree of suitability or value of a given soil for intensive agriculture. The rating is based upon soil characteristics only. Four factors that represent the inherent characteristics and qualities of the soil are considered in the index rating. The factors are profile characteristics, texture of the surface layer, slope, and other factors (e.g., drainage, salinity). Revised Storie Index numerical ratings have been combined into six classes as follows:

- Grade 1: Excellent (81 to 100)
- Grade 2: Good (61 to 80)
- Grade 3: Fair (41 to 60)
- Grade 4: Poor (21 to 40)
- Grade 5: Very poor (11 to 20)
- Grade 6: Nonagricultural (10 or less)

Table 3 below shows the Storie Index Rating for the soil contained on the site of 2400 Grant St.

Table 3: Storie Index Rating for 2400 Grant St.

Map symbol and soil name	California Revised Storie Index (CA)	
	Rating class	Value
103 Bale loam 0-2 percent slopes	Grade 2: Good (61-80)	70
United States Department of Agriculture, Custom Soil Resource Report for Napa County, California: 2400 Grant St. WebSoil Report, May 21, 2024.		

[1] Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices. Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both. The "w" subclass shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage).

Land Evaluation Worksheet

Table 4 shows the results of the total Land Capability Classification and Storie Index scores for 2400 Grant St. The Land Evaluation Worksheet concludes that, for LCC subclass 3w (non-irrigated), the site exhibits a Land Capability Classification score of 60 and a Storie Index score of 70.

Table 4: Land Evaluation Worksheet

Soil Map Unit[1]	Project Acres	Proportion of Project Area	LCC	LCC Rating [2]	LCC Score (C x E)	Storie Index[3]	Storie Index Score (C x G)
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**
103	35.6	1.00	3w (non-irrigated)	60	60	70	70
Totals	35.6	1.00		**LCC Total Score**	60	**SI Total Score**	70

1 The Soil Map Unit information and acreage were determined from the current soil survey information available at the USDA Natural Resources Conservation Service website: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
2 The LCC Rating for irrigated land was determined from the LCC Point Rating Table 2 from the LESA Instruction Manual (California Department of Conservation 1997).
3 United States Department of Agriculture, Custom Soil Resource Report for Napa County, California: 2400 WebSoil Report, May 21, 2024.

Site Assessment

Project Size Rating

The project size rating recognizes the role of farm size in determining the viability of commercial agricultural operations. Larger farming operations generally can provide greater flexibility in farm management and marketing decisions. In addition, larger operations tend to have the greatest impacts upon the local economy through direct employment, as well as impacts upon supporting industries and food processing industries (California Department of Conservation, 1997).

With regard to agricultural productivity, the size of the farming operation can be considered not just from its total acreage, but the acreage of different quality lands that comprise the operation. Lands with higher quality soils lend themselves to greater management and cropping flexibility and have the potential to provide greater economic return per acre unit. For a given project, instead of relying on a single acreage figure in the Project Size rating, the project site area is divided into three acreage groupings based upon the ratings that were previously determined in the Land Evaluation analysis. Under the Project Size rating, relatively fewer acres of high-quality soils are required to achieve a maximum Project Size score. Alternatively, a maximum score on lesser quality soils could also achieve a maximum Project Size score.

The Project Size Rating relies upon acreage figures that were tabulated under the Land Capability Classification Rating in Table 4.

The Project Size rating is based upon identifying acreage for the project site. Because there is only one soil type, there is only one score. **Table 5** below shows the Project Size Score for 2400 Grant St as 10.

Table 5: Project Size Score

	Site Assessment Worksheet 1		
	LCC Class 1-2	**LCC Class 3**	**LCC Class 4-8**
Project Acres per LCC Class	0	18	0
Total Project Acres per LCC Class	**0**	**18**	**0**
Project Size Scores	**0**	**10**	**0**
Highest Project Size Score	**10**		
Project Size Score was determined from the Project Size Scoring Table from the LESA Instruction Manual (California Department of Conservation 1997).			

Water Resources Availability Rating

The Water Resource Availability Rating is based on the various water sources that may supply a given property, and then determining whether different restrictions in supply are likely to take place in years that are characterized as drought and non-drought.

On June 7, 2024, the applicant provided a completed Water Resource Availability Questionnaire. According to the applicant, irrigated production is not feasible on the site, but rainfall is adequate for dryland production in both drought and non-drought years. In accordance with the LESA Water Resource Availability Scoring Table, a score of 25 was assigned. (see **Table 6**).

Table 6: Water Resources Availability

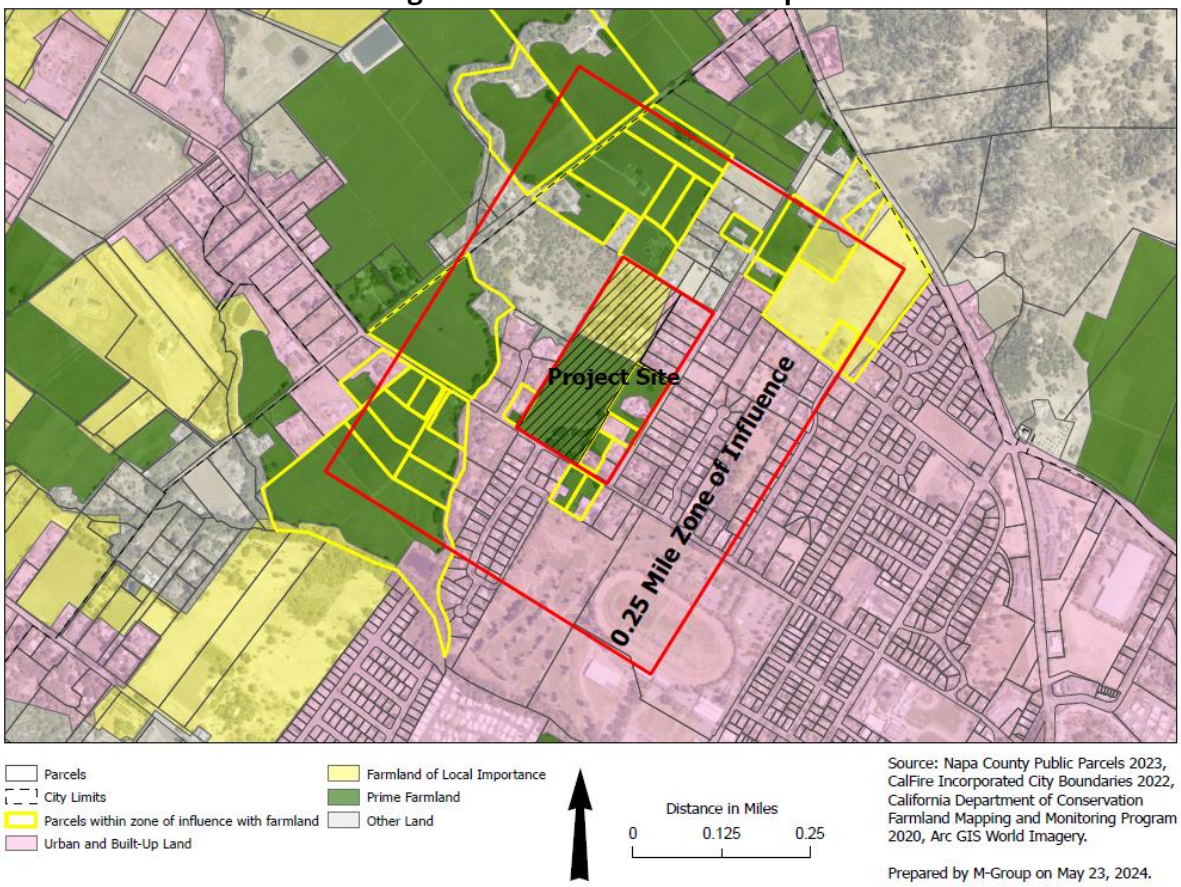
Site Assessment Worksheet 2				
Project Portion	**Water Source**	**Proportion of Project Area**	**Water Availability Score**	**Weighted Availability Score (C x D)**
All	N/A	1.0	25	25
		(Must Sum to 1.0)	**Total Water Resource Score**	25
Source: Water Resource Availability Questionnaire received on June 7, 2024; Water Resources Availability Scoring Table from the LESA Instruction Manual (California Department of Conservation 1997).				

Surrounding Agricultural Land Rating

The Surrounding Agricultural Land Rating is designed to provide a measurement of the level of agricultural land use for lands within the Zone of Influence of the project site. The "Zone of Influence" is the amount of surrounding lands up to a minimum of one-quarter mile from the project site boundary. Parcels that are intersected by the quarter-mile buffer are included in their entirety. Based on the percentage of agricultural land in the Zone of Influence, the project site is assigned a "Surrounding Agricultural Land" score.

The LESA Model rates the potential significance of the conversion of an agricultural parcel that has a large proportion of surrounding land in agricultural production more highly than one that has a relatively small percentage of surrounding land in agricultural production (California Department of Conservation, 1997). **Figure 2: Zone of Influence** shows the extent of the Zone of Influence in each direction from the project site.

Figure 2: Zone of Influence Map



Lands surrounding 2400 Grant St. are designated as Urban and Built-Up Land, Farmland of Local Importance, Prime Farmland, and Other Land, according to the Department of Conservation's Important Farmlands Map classifications that are used to assist in determinations of agricultural land. The Surrounding Agricultural Land score for the project site is shown in **Table 7**. In order to ensure the most conservative analysis possible, all vacant parcels one acre or more that were not designated as urban/built were considered farmland. The parcels identified with any portion of farmland were added in their entirety.

A list of all the agricultural parcels within the Zone of Influence, their land use category, and acreages can be found in **Appendix A**. As shown in Table 7 below, 48% of the land within the project's Zone of Influence is classified as Surrounding Agricultural Land. The LESA Model assigns a score of "20" where Surrounding Agricultural Lands constitute 45-49% of the project's Zone of Influence. As such, the Surrounding Agricultural Lands score for the project is "20."

Table 7: Surrounding Agricultural Land & Surrounding Protected Resource Land

Site Assessment Worksheet 3						
Zone of Influence*					Surrounding Agricultural Land Score (From LESA Manual Table 6)	Surrounding Protected Resource Land Score (From LESA Manual Table 7)**
Total Acres	Acres in Agriculture	Acres of Protected Resource Land	Percent in Agriculture (B/A)	Percent Protected Resource Land (C/A)		
(A)	(B)	(C)	(D)	(E)	(F)	(G)
339.0	163.0	0	48%	0%	20	0

* In conformance with the instructions in the LESA Instruction Manual (California Department of Conservation 1997), the Zone of Influence was determined by drawing the smallest rectangle that could completely encompass the entire Project Area. A second rectangle was then drawn which extended one quarter mile on all sides beyond the first rectangle. The Zone of Influence is represented by the entire area of all parcels with any lands inside the outer rectangle, less the area of the proposed project.

** The LESA Instruction Manual (California Department of Conservation 1997) describes *Protected Resource Land* as those lands with long term use restrictions that are compatible with or supportive of agricultural uses of land. Included among them are the following: Williamson Act contracted lands; Publicly owned lands maintained as park, forest, or watershed resources; and Lands with agricultural, wildlife habitat, open space, or other natural resource easements that restrict the conversion of such land to urban or industrial uses.

Surrounding Protected Resource Land Rating

The Surrounding Protected Resource Land Rating is essentially an extension of the Surrounding Agricultural Land Rating and is scored in a similar manner. Protected resource lands are those lands with long-term use restrictions that are compatible with or supportive of agricultural uses of land, including:

- Williamson Act contracted land;
- Publicly owned lands maintained as park, forest, or watershed resources; and,
- Lands with agricultural, wildlife habitat, open space, or other natural resource easements that restrict the conversion of such land to urban or industrial uses.

There are no lands classified as Surrounding Protected Resource Lands within the project's Zone of Influence. The LESA Model provides a score of "0" where Surrounding Protected Resource Lands constitute less than 40% of the project's Zone of Influence. As such, the Surrounding Protected Resource Land score for the project is "0."

3. SUMMARY AND CONCLUSIONS

The LESA Model is weighted so that half of the total score is derived from the Land Evaluation and half from the Site Assessment. There are 50 points possible in each category, with a total possible score of 100. As shown in **Table 8**, the Land Evaluation subscore is 32.5 and the Site Assessment subscore is 8.25. The total LESA score for the Project site is 40.75.

Table 8: LESA Score Summary

	Factor Scores	Factor Weight	Weighted Factor Scores
Land Evaluation Factors			
Land Capability Classification	60	0.25	15.00
Storie Index	70	0.25	17.50
LE subtotal		0.50	32.50
Site Assessment Factors			
Project Size	10	0.15	1.50
Water Resource Availability	25	0.15	3.75
Surrounding Agricultural Land	20	0.15	3.00
Protected Resource Land	0	0.05	0.00
Site Assessment Subtotal		0.50	8.25
Total LESA Score			**40.75**

3.1. DETERMINATION OF SIGNIFICANCE

As shown in **Table 9**, a final LESA score between 40 to 59 is considered significant only if the Land Evaluation Subscore and the Site Assessment subscore are each greater than or equal to 20 points. The Site Assessment Subscore is 8.25 which is not over 20 points. Therefore, both scores are NOT over 20 points each and the project impacts to agricultural lands are not considered significant.

Table 9: California LESA Model Scoring Thresholds

Total LESA Score	Scoring Decision
0 to 39 Points	Not Considered Significant
40 to 59 Points	Considered Significant only if LE and SA subscores are each greater than or equal to 20 points
60 to 79 Points	Considered Significant unless either LE or SA subscore is less than 20 points
80 to 100 Points	Considered Significant

Conclusion

The proposed Project would subdivide 17.96 acres of existing vineyard for the purpose of creating 19 lots and 17 new single family residential homes. The Project was evaluated using the Land

Evaluation and Site Assessment Model (LESA), which is recommended by the California Department of Conservation's Division of Land Resource Protection to evaluate the environmental impacts of a project under the California Environmental Quality Act. The results of the LESA indicate that the project will not result in a significant impact to agricultural resources and no mitigation is required.

4. REFERENCE DOCUMENTS

Technical Appendices

The following technical appendices are incorporated herein by reference.

A. California Department of Conservation, Farmland Mapping and Monitoring Program, Zone of Influence Map and Parcel List prepared by M-Group on May 22, 2024.

B. United States Department of Agriculture, Custom Soil Resource Report for Napa County, California: 2400 WebSoil report, May 21, 2024.

C. Water Resource Availability Questionnaire prepared by Applicant and received on June 7, 2024.

Other Documents Referenced

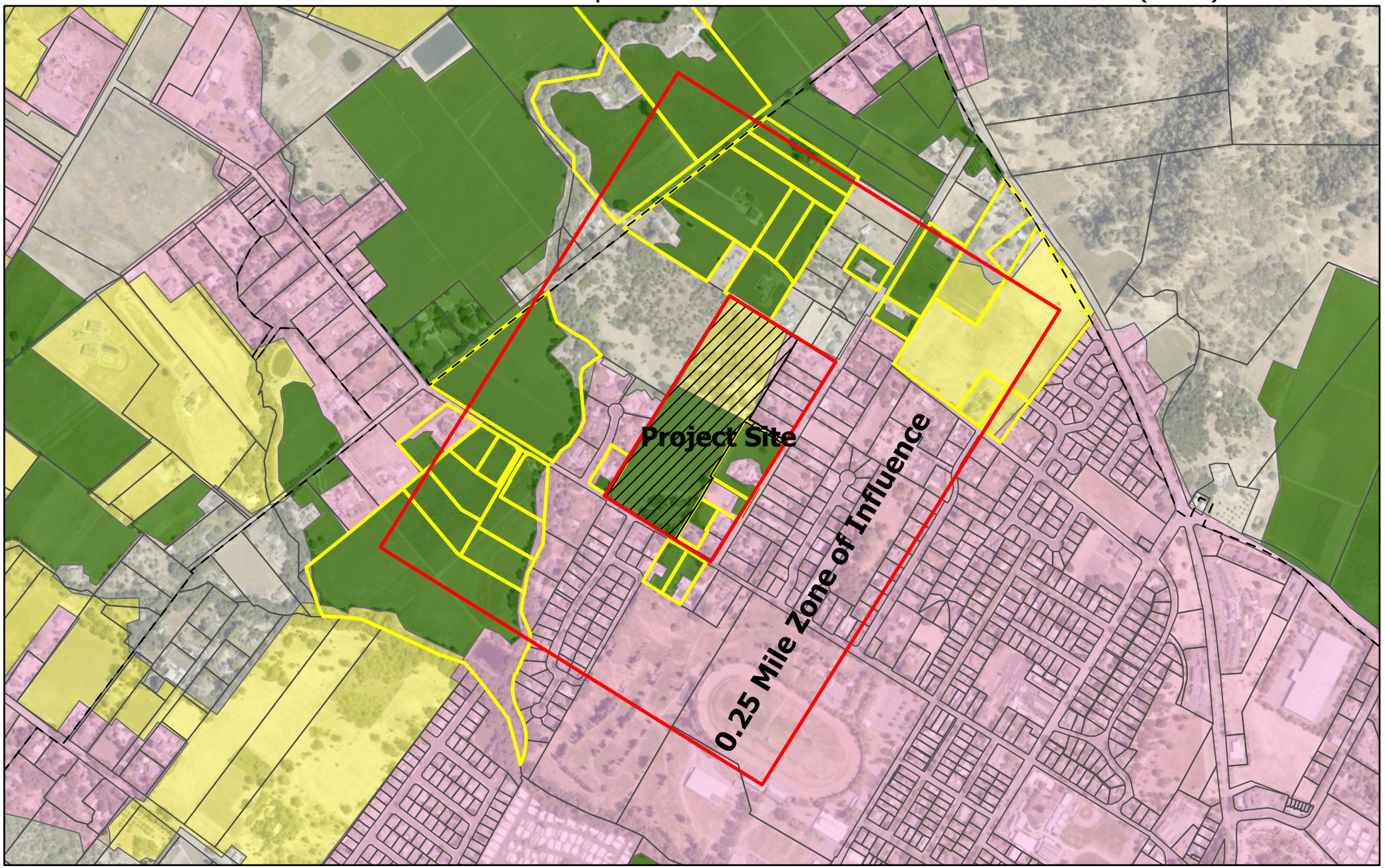
1. California Department of Conservation, California Agricultural Land Evaluation and Site Assessment (LESA) Model Instruction Manual, 1997, https://www.conservation.ca.gov/dlrp/Pages/qh_lesa.aspx.

2. California Department of Conservation, Farmland Mapping and Monitoring Program, 2023, https://www.conservation.ca.gov/dlrp/fmmp, accessed on May 21, 2024.

3. California Department of Conservation, 2023 Williamson Act Enrollment Finder. Website: https://maps.conservation.ca.gov/dlrp/WilliamsonAct/ accessed on May 23, 2024.

4. California Protected Areas Database Interactive Map. Website: https://www.mapcollaborator.org/cpad/?base=map&y=37.51844&x=-123.94775&z=6&layers=cpad_access%2Cnotes%2Cpolygons&opacs=50%2C100%2C25 accessed on May 23, 2024.

2400 Grant St. Zone of Influence Map for Land Evaluation and Site Assessment (LESA)



Parcels
City Limits
Parcels within zone of influence with farmland
Urban and Built-Up Land
Farmland of Local Importance
Prime Farmland
Other Land

Distance in Miles
0 0.125 0.25

Source: Napa County Public Parcels 2023, CalFire Incorporated City Boundaries 2022, California Department of Conservation Farmland Mapping and Monitoring Program 2020, Arc GIS World Imagery.

Prepared by M-Group on May 23, 2024.

Appendix A: 2400 Grant Street Zone of Influence Parcels

Area	Acres
Project Site	18
Total Area of parcels with any portion in ZOI	357
Total Area minus Project Area	339
Parcels w/agricultural lands (including fallow)	163
% Agricultural Land	48%
% Protected Land	0%

There are no Willimanson Act Contract lands in the ZOI.

There are no protected lands within the ZOI.

APN w/ farmland in 0.25 mile ZOI	Designation	Acres
011-010-002	local farm	5.09
011-010-016	other vacant	14.35
011-010-030	prime farm	13.14
011-010-049	local farm	1.22
011-010-050	local farm	16.44
011-010-051	local farm	1.22
011-021-011	prime farm	0.94
011-021-018	prime farm	0.93
011-021-020	prime farm	2.70
011-140-061	prime farm	1.00
011-140-062	prime farm	1.00
011-351-010	other vacant	1.91
011-351-017	prime farm	6.20
011-351-018	prime farm	4.10
011-351-026	prime farm	2.55
011-351-027	prime farm	1.70
011-351-028	prime farm	1.84
011-351-030	prime farm	1.06
011-351-031	prime farm	2.48
011-351-032	prime farm	2.31
011-351-039	other vacant	1.00
011-351-043	other vacant	1.00
011-352-004	prime farm	1.00
011-352-005	prime farm	3.22
011-390-016	prime farm	2.46
011-390-028	prime farm	1.03
011-390-029	prime farm	1.00
011-390-036	prime farm	1.84
011-390-037	prime farm	21.80
011-390-038	prime farm	2.47
011-390-039	prime farm	2.52
011-390-040	prime farm	2.54
011-390-041	prime farm	2.16
011-500-006	prime farm	0.92
017-230-020	prime farm	22.62
017-230-045	prime farm	12.89
TOTAL Farmland		**162.65**

California Revised Storie Index (CA)

The Revised Storie Index is a rating system based on soil properties that govern the potential for soil map unit components to be used for irrigated agriculture in California.

The Revised Storie Index assesses the productivity of a soil from the following four characteristics:

- Factor A: degree of soil profile development

- Factor B: texture of the surface layer

- Factor C: steepness of slope

- Factor X: drainage class, landform, erosion class, flooding and ponding frequency and duration, soil pH, soluble salt content as measured by electrical conductivity, and sodium adsorption ratio

Revised Storie Index numerical ratings have been combined into six classes as follows:

- Grade 1: Excellent (81 to 100)

- Grade 2: Good (61 to 80)

- Grade 3: Fair (41 to 60)

- Grade 4: Poor (21 to 40)

- Grade 5: Very poor (11 to 20)

- Grade 6: Nonagricultural (10 or less)

Reference:

O'Geen, A.T., Southard, S.B., Southard, R.J. 2008. A Revised Storie Index for Use with Digital Soils Information. University of California Division of Agriculture and Natural Resources. Publication 8355. http://anrcatalog.ucanr.edu/pdf/8335.pdf

Report—California Revised Storie Index (CA)

California Revised Storie Index (CA)–Napa County, California			
Map symbol and soil name	Pct. of map unit	California Revised Storie Index (CA)	
		Rating class	Value
103—Bale loam, 0 to 2 percent slopes			
Bale	85	Grade 2 - Good	70

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 16, Sep 11, 2023

Land Capability Classification

The land capability classification of map units in the survey area is shown in this table. This classification shows, in a general way, the suitability of soils for most kinds of field crops (United States Department of Agriculture, Soil Conservation Service, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

- Class 1 soils have slight limitations that restrict their use.
- Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.
- Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.
- Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.
- Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.
- Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.
- Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.
- Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion.

Report—Land Capability Classification

Land Capability Classification–Napa County, California				
Map unit symbol and name	Pct. of map unit	Component name	Land Capability Subclass	
			Nonirrigated	Irrigated
103—Bale loam, 0 to 2 percent slopes				
	85	Bale	3w	2w

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 16, Sep 11, 2023

2400 Grant St. Soil Map

Printed On: 5/21/2024

Produced by Napa County GIS

County of Napa | ITS Dept

Bale clay loam, 0 to 2 percent slopes

Cole silt loam, 0 to 2 percent slopes, MLRA 14

Bale loam, 0 to 2 percent slopes

, 11 to 60 percent slopes, MLRA 15

Hambright rock-Outcrop complex, 30 to 75 percent slopes

Bale clay loam, 2 to 5 percent slopes

Clear Lake clay, drained, 0 to 2 percent slopes, MLRA 14

Pleasanton loam, 2 to 5 percent

Legend

Soil Type

Parcels

0 0.05 0.1 0.2 mi

Disclaimer: This map was prepared for informational purposes only. No liability is assumed for the accuracy of the data delineated hereon.

Appendix C

Water Resource Availability Questionnaire - Land Evaluation and Site Assessment

Clarification on the terms and definitions used in this questionnaire are on the next page. Please review them prior to answering the questions.

1. Is irrigated production feasible on the property?

In non-Drought Years:	Yes	No
In Drought Years:	Yes	No

2. Are there physical restrictions to irrigation on the property?

In non-Drought Years:	Yes	No
In Drought Years:	Yes	No

If yes, please describe:

3. Are there economic restrictions to irrigation on the property?

In non-Drought Years:	Yes	No
In Drought Years:	Yes	No

If yes, please describe:

Check the box for any of the following that apply:

XXXX	Irrigated production is not feasible, but rainfall is adequate for dryland production in both drought and non-drought years.
	Irrigated production is not feasible, but rainfall adequate for dryland production in non-drought years (but not in drought years)
	Neither irrigated nor dryland production is feasible.

Definitions and Clarifications:

Physical Restriction - an occasional or regular interruption or reduction in a water supply, or a shortened irrigation season, that forces a change in agricultural practices -- such as planting a crop that uses less water or leaving land fallow. (This could be from cutbacks in supply by irrigation and water districts, or by ground or surface water becoming depleted or unusable. Poor water quality can also result in a physical restriction -- for example by requiring the planting of salt-tolerant plants, or by effectively reducing the amount of available water.)

Economic Restriction - a rise in the cost of water to a level that forces a reduction in consumption. (This could be from surcharge increases from water suppliers as they pass along the cost of finding new water supplies, the extra cost of pumping more ground water to make up for losses in surface water supplies, or the extra energy costs of pumping the same amount of ground water from deeper within an aquifer.)

Irrigated agricultural production is feasible when:

1) There is an existing irrigation system on the project site that can serve the project;
2) Physical and/or economic restrictions are not severe enough to halt production; and
3) It is possible to achieve a viable economic return on crops though irrigated production.

Dryland production is feasible when rainfall is adequate to allow an economically viable return on a non-irrigated crop.

Drought Year - a year that lies within a defined drought period, as defined by the Department of Water Resources or by a local water agency. Many regions of the state are by their arid nature dependent upon imports of water to support irrigated agriculture. These regions shall not be considered under periods of drought unless a condition of drought is declared for the regions that typically would be providing water exports.

Appendix B.

BIOLOGICAL RESOURCES ASSESSMENT

Biological Resources Assessment Technical Memorandum prepared by Greg Matuzak Environmental Consulting LLC on May 22, 2024.

From: Greg Matuzak Environmental Consulting LLC
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To: Brian Griggs
Griggs Group
Email: brian@griggsgroup.com
Phone: (925) 580-4902

Date: May 22, 2024

Re: **Biological Resources Assessment Technical Memorandum for the Vineyard Oaks Subdivision Project Located in the City of Calistoga, Napa County**

This Biological Resources Assessment Technical Memorandum (Tech Memo) has been developed in response to comments from the City of Calistoga on the May 8, 2024 Technical Memorandum regarding the 2400 Grant Street Development Project Preliminary CEQA Review for April 2024 Submittal. Included in the City of Calistoga's comments on the Vineyard Oaks Subdivision Project (Project) in the City of Calistoga in Napa County are the following regarding sensitive biological resources:

- Comment#1: "Wetlands are not present at the project site and no special status plant or animal species were observed as part of the 2008 or 2023 Biological Resources Assessments."
    - The 2023 Biological Resources Assessment did not specifically call out that the site survey included observation for signs of special status animal species (this was called out for plants but not called out for animals).
    - Written confirmation can be provided by the biologist to confirm no observation of indicators that special status animal species were present during the field survey.

- Comment#2: 4.1 Clarify if any field investigation occurred to document indicators of special status animal species at any time since 2008.
    - Same comment from above:
        - The 2023 Biological Resources Assessment did not specifically call out that the site survey included observation for signs of special status animal species (this was called out for plants but not called out for animals).

- Written confirmation can be provided by the biologist to confirm no observation of indicators that special status animal species were present during the field survey.

Therefore, this Tech Memo clarifies the comments from the City of Calistoga and concludes that the proposed Project does not pose any risk to any special-status species whether special-status plants or special-status wildlife. Furthermore, as concluded in Sections 3.4 and 3.5 of the Biological Resources Assessment developed by Ms. Lucy Macmillan (dated November 2023), "No potential wetlands were observed in the background review" and "No potential wetlands were observed on the project site."

Response to Comment #1

As stated above, Sections 3.4 and 3.5 of the Biological Resources Assessment developed by Ms. Lucy Macmillan (dated November 2023), "No potential wetlands were observed in the background review" and "No potential wetlands were observed on the project site." Additionally, Greg Matuzak, a CDFW Qualified Biologist, and biologist who conducted a site survey and developed an assessment for the Brewer's milk-vetch (*Astragalus brewei*), which was dated April 3, 2024, did not identify any sign of regulated aquatic resources, including wetlands, or sign of special-status plant habitat within the Project area.

For special-status wildlife species, the April 3, 2024 Biological Resources Assessment states the following:

"Due to the lack of streams, creeks and/or vernal pools on the site, it was determined that the site does not provide habitat for special-status species associated with aquatic or semi aquatic habitats. The site provides habitat for various nesting raptors and birds as well as protected bat species due to the presence of large oak trees and suitable foraging habitat."

Additionally, Table 1 within the April 3, 2024 Biological Resources Assessment has specific language regarding whether any special-status wildlife species were identified within the Project area and furthermore, whether the Project area contains suitable habitat for any of the special-status wildlife species within the list provided in Table 1. Therefore, given only suitable habitat for nesting birds and roosting bats was identified within the Project area and no special-status wildlife species were mentioned as being identified in the April 3, 2024 Biological Resources Assessment, then no special-status wildlife species were identified during previous surveys within the Project area.

Additionally, no special-status wildlife were identified within the Project area by Ms. Lucy Macmillan as part of the Biological Constraints Analysis covering the Project area (dated September 2007) or as part of the July 11, 2007 Preliminary Biological Resources Site Evaluation (also developed by Ms. Lucy Macmillan). During the follow up assessment by Mr. Matuzak on April 1, 2024, there was no sign of any special-status wildlife species within the Project area and Mr. Matuzak concurs with the finding that the Project area only contains suitable habitat for nesting birds and roosting bats.

Response to Comment #2

No special-status plants or wildlife have been identified within the Project area since the initial review of the site in 2007. Since 2007, there have been a total of four (4) site assessments covering the Project area. The first was by Ms. Lucy Macmillan and written up in her July 11, 2007 Preliminary Biological Resources Site Evaluation. The second was also by Ms. Lucy Macmillan as part of the Biological Constraints Analysis covering the Project area (dated September 2007). The third evaluation was also conducted by Ms. Lucy Macmillan as part of the November 2023 Biological Resources Assessment covering the Project area. Lastly, during the follow up assessment by Mr. Matuzak on April 1, 2024, which was the fourth site assessment by a qualified biologist since 2007, there was no sign of any special-status wildlife species within the Project area.

Therefore, during the 4 site assessments outlined above that cover the Project area since 2007, no special-status wildlife or plants have been identified within the Project area. Mr. Matuzak concurs with the finding in the latest November 2023 Biological Resources Assessment developed by Ms. Lucy Macmillan that the Project area only contains suitable habitat for nesting birds and roosting bats.

Let me know if you have any questions or comments on this Tech Memo, which should suffice as a qualified response to the comments by the City of Calistoga regarding sensitive biological resources within the Project area. I can be reached at the phone number and email listed at the top of this proposal.

Regards,

Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC

Appendix C.

TREE EVALUATION

Tree Evaluation for 2400 Grant Street prepared by Bob Peralta Arbor Consulting on April 25, 2025.

Tree Evaluation

Prepared For:

Jeff Stone

Diamond Construction

P.O. Box 477

Lafayette, CA 94549

For Project

2400 Grant Street in Calistoga

Prepared By:

Bob Peralta

Bob Peralta Arbor Consulting

American Society of Consulting Arborists

237 Berna Avenue

Napa, California 94559

(707) 332-5980

April 25, 2025

Dear Jeff,

Thank you for asking me to provide a Consulting Arborist Report for your Proposed Project located at 2400 Grant Street in Calistoga, California 94515. The APN number for the project located off 2400 Grant Street is: **APN: 011-010-057**. I visited the site on March 27, 2024, to review all the trees on the 17.96-acre parcel. I also reviewed the Tentative Map/2400 Grant Street Subdivision/Tree Site Map provided to you by Adobe Associates, Inc. – dated April 21, 2025 – Job No – 23270 using Sheet C2.0. This map shows the trees, trees canopy, project removals using a red X, and the location of the proposed homes. There are a total of 16 Project Removals shown on the Topographic Survey and in **Attachment 1** – Spreadsheet with all the trees and the removals in Red.

There are a total of 227 trees that were evaluated that met the criteria of **Calistoga Protected Tree -** using the City of Calistoga's Tree Protection Ordinance Chapter 19.01, Pages 1-7. Native Valley Oak trees (Quercas lobata) that are 6" or greater are protected trees under the Calistoga Municipal Code - 19.01.040. I walked each tree adding a tree tag and assessing each protected tree with the surveyor. Due to limited cell service not all the pictures of each tree could be uploaded. If needed individual pictures of those trees can be taken.

Attachment 1 - is a Spreadsheet showing all the Parameters that were taken on each tree. The assessment method used is shown below and the results in Table 1, and Table 2 identifies the Project Removals.

In Attachment 3 - on the Plan Sheet, all remaining trees will be protected using the Root Protection Guidelines (RPZ) on all protected trees. See Attached Tentative Map – Grading and Drainage Plan showing the Root Protection Fencing Zone – Sheet C4.1 – dated May 22, 2024.

Below are the Requirements:

Protected Tree in Calistoga, California

1. Any tree with a DBH greater than 12 inches.
2. Any native oak with a DBH greater than six inches.
3. Any Valley Oak, seedling, sapling, or older.

4. Any tree bearing an active nest of a fully protected bird (see Fish and Game Code Section 3511).

There are (9) species of trees located on the property using the Tree Site Map:

1. 216 – Valley Oaks (Quercas lobata)
2. 3 – California Black Walnut (Juglans californica)
3. 2 – Coast Live Oaks (Quercas agrifolia)
4. 1 – Stone Pine (Pinus pinea)
5. 1 – California Fan Palms (Washingtonia filifera)
6. 1 – Coast Redwood (Sequoia sempervirens)
7. 1 – Canary Island Pine (Pinus canariensis)
8. 1 – Catalina Cherry (Prunus ilicifolia)
9. 1 – English Walnut

Assessment Methods

I assessed (227) trees on March 25, 2024. The assessment procedure consisted of each tree of any size assessed visually from the ground and evaluated as follows:

1. Identifying the tree as to species.
2. Identifying each tree with a numerical GPS plotted number
3. Measuring the trunk diameter at a point 54" above grade.
4. Evaluate Health and Safety

Evaluating the health and structural condition using a scale of 0 – 5:

5 - A healthy, vigorous tree, reasonably free of signs and symptoms of disease, with good structure and form typical of the species.
4 - Tree with slight decline in vigor, small amount of twig dieback, or minor structural defects that could be corrected.
3 - Tree with moderate vigor, moderate twig and small branch dieback, thinning of crown, poor leaf color, moderate structural defects that might be mitigated with regular care.
2 - Tree in decline, epicormic growth, extensive dieback of medium to large branches, significant structural defects that cannot be abated.
1 - Tree in severe decline, dieback of scaffold branches and/or trunk; most of foliage from epicormic shoots (secondary shoots that arise along the trunk and branches); extensive structural defects that cannot be abated.
0 – Tree is dead.

Listed below in Table 1 are the number of each species of trees and their health rating using the 0 to 5 scale described above:

Table 1. Tree Species and Health Rating.

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Tree Species Name	**Dead** (0)	**Critical** (1)	Poor (2)	Fair (3)	Good (4)	Very Good (5)	**Totals**
Valley Oaks	5	13	26	172			216
California Black Walnut			1	2			3
English Walnut				1			1
Coast Live Oaks				2			2
Stone Pine				1			1
California Fan Palms				1			1
Coast Redwood				1			1
Canary Island Pine				1			1
Catalina Cherry		1					1
Totals by Health Rating	5	14	27	181			**227**

The health and structure of the trees were assessed visually from ground level. No drilling, root excavation, or ariel inspections were performed. Internal or non-detectable defects may exist and could lead to part of whole tree failures. Due to the dynamic nature of trees and their environment, it is not possible for Arborists to guarantee that trees will not fail in the future.

Report Summary

This is a unique property that has a mature Vineyard in the front half of the property and with 45 trees around the existing home and 182 trees in the back half. What sets this property apart are the Valley oaks that have been untouched for many years. These are old trees that have had no maintenance and have matured naturally. They are in various stages of health show pit scale and signs of stress. The stress is the accumulation of winter rainwater in many parts of the property where the trees can stay saturated for weeks. The age of the trees are small seedlings to mature trees in the grove where there is extensive Poison Oak and access was very limited (Attachment 2). Because the property has been weed abated through mowing or discing there are no new sprouts throughout the property. The small seedlings are in the Grove between Trees Tags 232 and 239 North to South (Pictures in Attachment 2).

Several oaks have two, to multiple codominant stems that can be a risk over time, the risk can be reduced with expertise pruning by a Certified Arborist. Many of the Valley Oaks are growing in clusters where the dominant trees have overshadowed the smaller trees creatin a leaning or half canopy. These are rated as Poor to fair and can be pruned over several years to try and correct or make the trees safe.

Trees that will be part of the open space areas can be left untouched or minor deadwood pruning to keep the structure of the smaller trees. Trees that are

incorporated into the lots have recommendations in the objectives in the Attached Spreadsheet (Attachment 1) - Objectives are to Crown Clean, Crown Restore, deadwood or crown raise. In (Attachment 1) the Excel sheet shows the Tag Number, Species, Objective, height, DBH (Diameter), Health, and drip Line sq.ft. Table 2 Identifies the Project Removals.

Table 2 – Project Removals Highlighted in Red on Attachment 1

2400 Grant Street - Tree Removal Summary			
Tag #	Tree Type	DBH (in)	Drip Line Area [sf]
101	Valley Oak	20	1910
103	Valley Oak	12	600
104	Valley Oak	15	640
116	Valley Oak	9	1080
117	Valley Oak	7,8,12	1400
120	Valley Oak	12.3	300
121	Valley Oak	9.5	380
145	Valley Oak	10.8	390
176	Black Walnut	18	1060
177	Black Walnut	9	1300
212	Valley Oak	6	220
216	Valley Oak	6	220
228	Valley Oak	7	220
229	Valley Oak	8	220
230	Valley Oak	6	220
231	Valley Oak	8	220

*See Existing Condition Map for location on site

City of Calistoga Root Protection Zone Guidelines (RPZ)

19.01.040 Requirements.
A. Protected Trees (Attachment 4 in the Plans Sheet Notes)

1. Any tree with a DBH greater than 12 inches.

2. Any native oak with a DBH greater than six inches.

3. Any Valley Oak, seedling, sapling, or older.

4. Any tree bearing an active nest of a fully protected bird (see Fish and Game Code Section 3511).

A. 19.01.020 Root Protection Zone as defined in CMC Section 19.01.020 means a circle around the trunk of a tree, the radius of which equal to the largest radius of the trees 's dripline plus 50% of that radius.

B. 19.01.040(B) Calls for Temporary Protective Fencing around the outer margins of the "Root Protection Zone".

Before the start of any on-site work, every protected tree within or immediately adjacent to the area of on-site work shall have installed around it a **temporary Root protective fence at the outer margin of the root protection zone (Attachment 3) and an example of a Root Protection Zone (Attachment 5),** The fence shall remain in place and be properly maintained for the duration of all work at the site.

C. Restrictions. Any disturbances including, but not limited to the following, which might cause harm to a protected tree, are strictly prohibited within the root protection zone of that tree, unless otherwise exempted (see below) or unless a tree permit is obtained that specifically grants such an exemption:

1. Removal of a protected tree;

2. Removal of any heritage tree without specific approval of the Council;

3. Removing, moving, or failing to install and maintain proper temporary protective fencing prior to completion of all on-site work;

4. Parking or use of vehicles, equipment, or of other devices which might compact the soil;

5. Storage or use of construction materials;

6. Storage or use of chemicals or of other substances which might be harmful to trees;

7. Pruning shall be performed in accordance with WCISA standards;

8. Trenching, including that required for an irrigation system;

9. Any permanent or temporary structures;

10. Grading, cutting, filling, or changing the natural grade in any way;

11. Installation of irrigation system;

12. Irrigation within 10 feet of a trunk of a tree;

13. Attaching signs, posters, notices, wires, or devices of any sort to the trunk;

14. Covering with any substance impermeable to air and rain water, such as asphalt, concrete, plastic, etc.;

15. Burning, open fires, open flames;

16. Chemical toilets;

17. Compaction of the soil;

18. Cleaning or washing any tools or equipment such as paint brushes, masonry trowels, cement mixtures, etc.;

19. Installation of a septic system and/or leach lines immediately up-grade from a protected tree.

I have been contracted by you to install and monitor the Root Protection Zone for your Protected Trees. This monitoring will include being on site during grading or excavation activity near any protected tree. Below are additional recommended Root Protection Zone Guidelines that can also be incorporated into the Calistoga RPZ Requirements.

Additional Recommended Root Protection Zone Guidelines
All contractors including demolition, grading, and underground contractors, sub-contractors, construction superintendent and other pertinent personnel should be required to review these guidelines with the Project Arborist (PA) prior to beginning work on site. The Root Protection Zone (RPZ) identifies will be installed 2' outside of the dripline in a half circle on all sides of the proposed home - by installing 4' high orange protective fencing around the entire drip-line of the tree and roots from disturbance.

The installation will be installed by the Project Arborist (Bob Peralta) and any work within the erected RPZ will need permission from the PA before being moved.

The following signs will be posted on 8.5x11 inches and installed on all the fences – the sign will read:

This is a Tree Root Protection Zone
Movement of this fence requires the prior authorization of the Project Arborist & Owner

(List Contact Information)

Activities prohibited within the RPZ include:

- Storage or parking vehicles, building materials, refuse, excavated spoils, or dumping of paint or poisonous materials on or around trees and roots. Poisonous materials include, but are not limited to, paint, petroleum products, concrete or stucco mix dirty water or any other material which may be deleterious to tree health.

- The use of tree trunks as winch support, anchorage, as a temporary power pole, sign-post or any other similar function.

- Cutting of roots by utility trenching, foundation digging, placement of curbs, trenches and other miscellaneous excavation without prior approval of the PA.
- Soil disturbance or grade/drainage changes.

- Materials must not be stored, stockpiled, dumped, even temporarily, inside the RPZ of protected trees.

Activities permitted within the RPZ include or as needed or recommended by the PA.

- Irrigation, aeration, or other beneficial practices that have been specifically approved for use within the RPZ.

- Mulch if needed and or fertilization as recommended by monthly site visits by the PA.

- Each site visit will require a report recommending tree healthcare supplements, recommended watering as needed during peak summer months and reduction into Fall and Winter.

Please give me a call if you have any questions.

Sincerely,

Bob Peralta

Bob Peralta
Certified Arborist WE-7150A
ASCA Consulting Arborist #505

Attachment 1 – Spreadsheet of all trees and tag numbers

2400 Grant Street - Tree Removal Summary				
Tree Count	Tag #	Tree Type	DBH (in)	Drip Line Area [sf]
1	1	Valley Oak	10,10	400
2	2	Valley Oak	10	540
3	3	Valley Oak	8	700
4	4	Valley Oak	6.5	410
5	5	Valley Oak	6	280
6	6	Valley Oak	8,8,10	400
7	7	Valley Oak	10.3	120
8	8	Valley Oak	9.5	200
9	9	Valley Oak	26.7	840
10	10	Valley Oak	24.7	1016
11	11	Valley Oak	12.3	40
12	12	Valley Oak	28	275
13	18	Valley Oak	7.5	500
14	19	Valley Oak	15	720
15	20	Valley Oak	17	470
16	21	Valley Oak	13	340
17	22	Valley Oak	14.9	700
18	27	Valley Oak	21.8	350
19	28	Valley Oak	17	300
20	31	Valley Oak	11,12	370
21	37	Valley Oak	11,14	2366
22	38	Valley Oak	6,7,8	1200
23	39	Valley Oak	8,9	400
24	40	Valley Oak	29.5	2550
25	41	Valley Oak	7,7,9,9	1700
26	42	Valley Oak	15	2100
27	45	Valley Oak	10,11	2600
28	46	Valley Oak	3,15	750
29	47	Valley Oak	28.3	2300
30	52	Valley Oak	15.6,17.3,18	2100
31	53	Valley Oak	25.5	2160
32	54	Valley Oak	25.8	1700
33	55	Valley Oak	33.5	2347
34	56	Valley Oak	12,17	2065

35	57	Valley Oak	13,20	2380
36	58	Valley Oak	14,16,16	1040
37	59	Valley Oak	9.5	460
38	60	Valley Oak	9,12,14,18	1860
39	61	Valley Oak	12	1910
40	62	Valley Oak	18	1400
41	63	Valley Oak	4,9,10	895
42	64	Valley Oak	10,12	550
43	65	Valley Oak	11,18	590
44	66	Valley Oak	16,16	685
45	67	Valley Oak	6,15	590
46	68	Valley Oak	15	470
47	69	Valley Oak	14	590
48	70	Valley Oak	12,14	570
49	71	Valley Oak	14	530
50	72	Valley Oak	14	460
51	73	Valley Oak	4,12,13	490
52	75	Valley Oak	14,17	750
53	76	Valley Oak	9,10	560
54	77	Valley Oak	13,19	370
55	78	Valley Oak	13,14,17	2005
56	79	Valley Oak	27	1370
57	80	Valley Oak	10,10	1350
58	81	Valley Oak	15	1590
59	82	Valley Oak	11,18	450
60	83	Valley Oak	12	260
61	84	Valley Oak	13	910
62	85	Valley Oak	6,7,9,9,11	1110
63	86	Valley Oak	10,11	1070
64	87	Valley Oak	6,8	590
65	89	Valley Oak	8,10	330
66	90	Valley Oak	8	210
67	91	Valley Oak	11.5	530
68	92	Valley Oak	7,9,11	600
69	93	Valley Oak	12,13	590
70	94	Valley Oak	7,12	510
71	95	Valley Oak	14	780
72	96	Valley Oak	35	2300
73	97	Valley Oak	8	240
74	98	Valley Oak	14,16,18	890
75	99	Valley Oak	11	960

76	100	Valley Oak	18	1400
77	101	Valley Oak	20	1910
78	102	Valley Oak	27.9	2610
79	103	Valley Oak	12	600
80	104	Valley Oak	15	640
81	105	Valley Oak	6,9	400
82	106	Valley Oak	22	450
83	107	Valley Oak	9	620
84	108	Valley Oak	6	190
85	109	Valley Oak	18.8	1060
86	110	Valley Oak	24	1650
87	111	Valley Oak	22.8,24	2195
88	112	Valley Oak	16.2,22	2160
89	113	Valley Oak	10,11,11	1400
90	114	Valley Oak	15.6,18	940
91	115	Valley Oak	4,12,16	1340
92	116	Valley Oak	9	1080
93	117	Valley Oak	7,8,12	1400
94	120	Valley Oak	12.3	300
95	121	Valley Oak	9.5	380
96	122	Valley Oak	17	860
97	123	Valley Oak	11	660
98	124	Valley Oak	11,12	370
99	126	Valley Oak	11	570
100	128	Valley Oak	9	620
101	129	Valley Oak	9	620
102	130	Valley Oak	9	640
103	131	Valley Oak	12	650
104	132	Valley Oak	3,6,8	350
105	133	Valley Oak	6,6	480
106	134	Valley Oak	6	270
107	136	Valley Oak	4,5,6,6,7	630
108	137	Valley Oak	4,6,12	300
109	138	Valley Oak	8	560
110	139	Valley Oak	7,8,8,8,10	620
111	140	Valley Oak	6	210
112	141	Valley Oak	3,6	280
113	142	Valley Oak	6	240
114	143	Valley Oak	4,5	540
115	144	Valley Oak	6	450
116	145	Valley Oak	10.8	390

117	146	Valley Oak	20,26,31	1310
118	148	Valley Oak	11,11	1670
119	149	Valley Oak	9,10,12	2160
120	150	Valley Oak	6,9,10	830
121	151	Valley Oak	12,13	1960
122	152	Valley Oak	8,10,10	1300
123	153	Valley Oak	10	665
124	154	Valley Oak	10,30.7	2200
125	155	Valley Oak	12.5	1650
126	156	Valley Oak	10,12, 14.2	600
127	157	Valley Oak	30	420
128	158	Valley Oak	35	520
129	159	Valley Oak	8	230
130	160	Valley Oak	11,11,28	500
131	161	Valley Oak	10	290
132	162	Valley Oak	11	400
133	163	Valley Oak	16	1000
134	164	Valley Oak	28	930
135	165	Valley Oak	13	610
136	166	Black Walnut	13	660
137	167	Coast Live Oak	18	550
138	168	Valley Oak	13.5	620
139	169	Valley Oak	15.7	240
140	170	Valley Oak	11	640
141	171	Valley Oak	9	610
142	172	Valley Oak	6,6	460
143	173	Valley Oak	14	600
144	174	Valley Oak	28	730
145	175	Valley Oak	27.2	910
146	176	Black Walnut	18	1060
147	177	Black Walnut	9	1300
148	178	Valley Oak	18,30	2600
149	180	Black Walnut	21	1140
150	181	Valley Oak	22.5	910
151	183	Valley Oak	18,22	1300
152	185	Italian Stone Pine	13,18	1030
153	186	Valley Oak	38	1685
154	187	Valley Oak	32.5	1020
155	188	Valley Oak	33.8	1500
156	193	California Fan Palm	30	320

157	194	Valley Oak	19.6	544
158	195	Canary Island Pine	16.6	400
159	196	Sequoia Redwood	20	250
160	197	Valley Oak	45	3350
161	201	Valley Oak	6	290
162	202	Valley Oak	6	300
163	203	Valley Oak	6	220
164	204	Valley Oak	9	220
165	205	Valley Oak	6	220
166	206	Valley Oak	6	220
167	207	Valley Oak	8	220
168	208	Valley Oak	8	220
169	209	Valley Oak	6	220
170	210	Valley Oak	8	220
171	211	Valley Oak	6	220
172	212	Valley Oak	6	220
173	213	Valley Oak	6	220
174	214	Valley Oak	6	220
175	215	Valley Oak	8	220
176	216	Valley Oak	6	220
177	217	Valley Oak	7	220
178	218	Valley Oak	6	220
179	219	Valley Oak	6	220
180	220	Valley Oak	6	220
181	221	Valley Oak	8	220
182	222	Valley Oak	8	220
183	223	Valley Oak	8	220
184	224	Valley Oak	7	220
185	225	Valley Oak	6	220
186	226	Valley Oak	8	220
187	227	Valley Oak	6,6	220
188	228	Valley Oak	7	220
189	229	Valley Oak	8	220
190	230	Valley Oak	6	220
191	231	Valley Oak	8	220
192	232	Valley Oak	6	220
193	233	Valley Oak	7	220
194	234	Valley Oak	7	220
195	235	Valley Oak	8	220
196	236	Valley Oak	6	220
197	237	Valley Oak	8	220

198	238	Valley Oak	8	220
199	239	Valley Oak	8	220
200	240	Valley Oak	6	220
201	241	Valley Oak	8	220
202	242	Valley Oak	7	220
203	243	Valley Oak	6	220
204	244	Valley Oak	6	220
205	245	Valley Oak	6	220
206	246	Valley Oak	6	220
207	247	Valley Oak	6	220
208	248	Valley Oak	6	220
209	249	Valley Oak	15,15,18	2800
210	250	Valley Oak	10	250
211	251	California Black Walnut	12	250
212	252	Valley Oak	12	220
213	253	Valley Oak	12	220
214	254	Valley Oak	14	220
215	255	Valley Oak	12	220
216	256	Valley Oak	12	220
217	257	Valley Oak	12	220
218	258	Valley Oak	14	220
219	259	Valley Oak	12	220
220	260	Valley Oak	12	220
221	261	Valley Oak	12	220
222	262	Valley Oak	12	220
223	263	Valley Oak	12	220
224	264	Valley Oak	10	220
225	265	Valley Oak	12	220
226	391	Valley Oak	8.8,9,9.3	220
227	500	Catalina Cherry	8	100

***See Existing Condition Map for location on site**

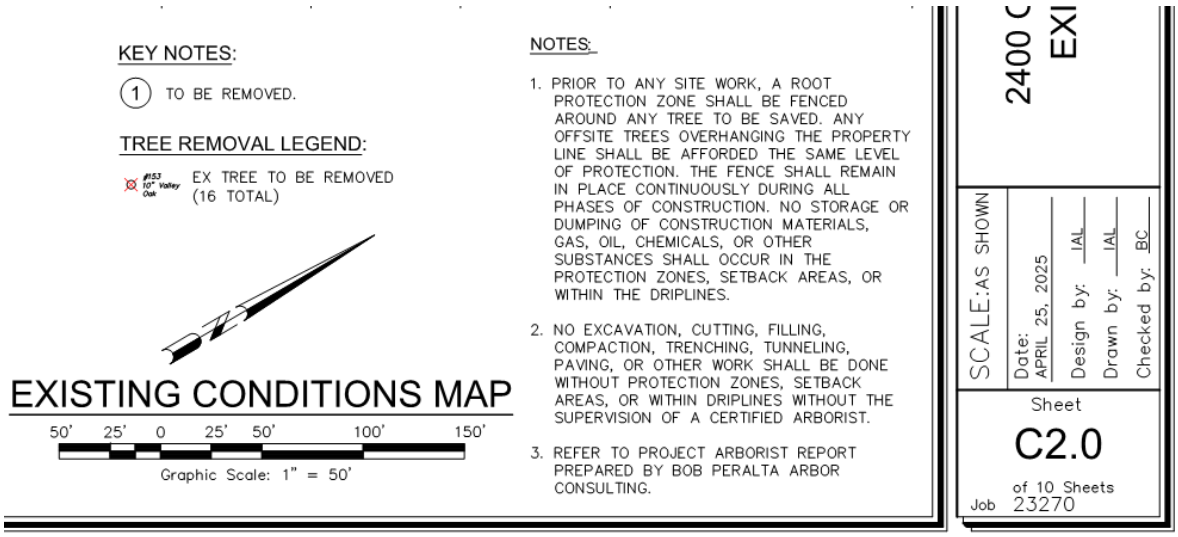
****Trees in red are planned to be removed (16 total)**

Attachment 2 – Pictures - Grove Trees with Poison Oak

Attachment 3

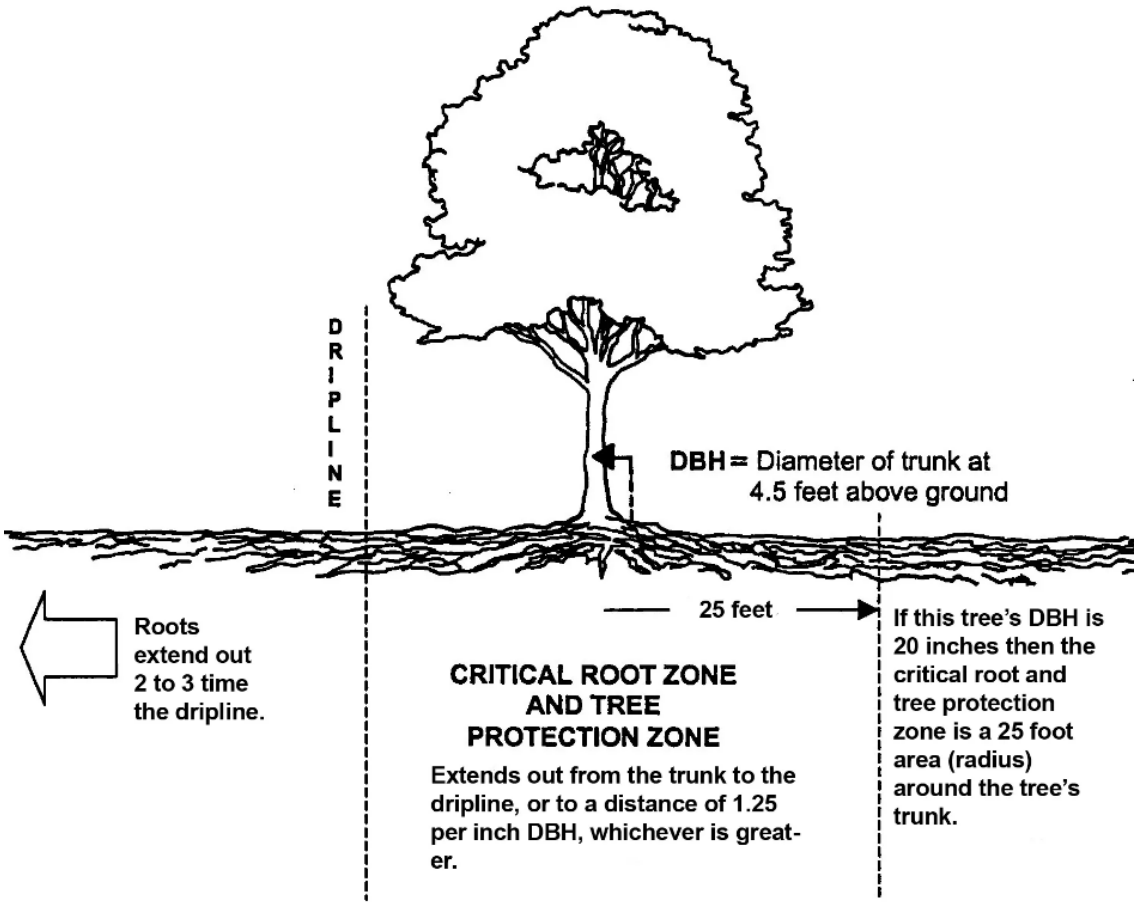
See Attached Tentative Map – Grading and Drainage Plan showing the Root Protection Fencing Zone – Sheet C4.1 – dated April 25, 2025.

Attachment 4



Attachment 5

CRITICAL ROOT ZONE



Appendix D.

PRELIMINARY STORMWATER CONTROL PLAN

Preliminary Stormwater Control Plan prepared by Adobe Associates, Inc. on May 21, 2025.

Preliminary Stormwater Control Plan

For Regulated Project

2400 Grant Street, Calistoga, CA
APN 011-010-057

JN 23270
May 21, 2025

Prepared for:

2400 Associates, LLC.
Jeff Stone
PO Box 477
Lafayette, CA. 94549
Phone: 1 (925) 383-7122
Email: jbstone@diamondconstructioninc.com

Timothy L. Schram, RCE 67890
My license expires 6/30/2025

Prepared by:

adobe associates, inc.
civil engineering | land surveying | wastewater
1220 N. Dutton Ave., Santa Rosa, CA 95401
P. (707) 541-2300 F. (707) 541-2301
Website: www.adobeinc.com

Prepared By: IL, DL
Checked By: BC

Table of Contents

Preliminary Stormwater Control Plan for Regulated Project
2400 Grant Street

I. Project Data

Project Name	2400 Grant Street Subdivision
Application Submittal Date	January 2024
Project Location	2400 Grant Street, Calistoga, Ca
Project Phase No.	N/A
Project Type and Description	Single Family Homes on 1 acre parcels
Total Project Site Area	~17.97 Acres
Total New and Replaced Impervious Surface Area	65,096 SF
Total Pre-Project Impervious Surface Area	5,313 SF
Total Post-Project Impervious Surface Area	65,020 SF
Runoff Reduction Measures Selected	Bioretention Facilities

II. Project Setting

A. Nature and Purpose of the Project

The project is located at 2400 Grant Street, Calistoga, California. This project proposes grading and drainage improvements for a new subdivision consisting of 17 lots for single-family homes and associated hardscaping. The parcel is approximately 17.97 acres, and the total area of disturbance is approximately 2.25 acres. The lot is partially developed consisting of an existing gravel driveway, existing vineyard, existing residence & sheds.

B. Existing Site Features and Conditions

The existing parcel relatively flat with slopes ranging from 1% to 4%, The highest slopes being directly adjacent to the northeasterly property boundary at approximately 4%. Runoff currently sheet flows southerly, from the northerly property corner, towards an existing drainage ditch along Grant Street. From that point, stormwater flows southeasterly through a series of culverts to the existing storm drain system along Grant Street. This discharges into an open channel at the fairgrounds that flows south westerly to two 48" concrete culverts and then to a 54" concrete culvert that outfalls to Napa River which then eventually leads to San Pablo Bay.

C. Opportunities and Constraints for Stormwater Control

Pursuant to the BASMAA Post – Construction Manual, this project is classified as a regulated project. This style of project is required to direct runoff from impervious surfaces to one or more runoff reduction measures.

Runoff from the proposed impervious areas will be directed towards proposed bioretention facilities via sheet flow or through a storm drain network. The

proposed residences & private road is expected to create 185,486 square feet of impervious surface. Please see attached **Stormwater Control Plan** for Drainage Management Areas (DMA) and proposed BMPs.

Natural Resources such as existing trees will be minimally disturbed as the improvements are along the outer edge of the property line, and most of existing trees are located towards the center of the property.

Drainage constraints include a lack of storm drain network infrastructure directly at the frontage of the property. Opportunities are a favorable southeast gentle slope (1-4%) that allow storm water runoff to flow to the planned flowlines & bioretention facility.

III. Low Impact Development Design Strategies

A. Optimization of Site Layout

The site is laid out in a way to maximize the amount of pervious areas capable of being drained to. The driveway, and hardscaping are situated with as much adjacent vegetated area to break up the impervious surface footprint as much as possible, additionally runoff from impervious surfaces have been designed to drain through vegetated swales prior to entering the bioretention. The site storm water system is designed with the intent to mimic pre-construction drainage patterns.

B. Dispersal of Runoff to Pervious Areas

All runoff leaving DMA-1 will be dispersed to bioretention facilities to provide retention and treatment prior to leaving the site. The bioretention facility was sized to include all impervious areas.

IV. Documentation of Drainage Design

A. Description of Drainage Management Areas

DMA-1 totaling 762,428 square feet, drains to BR-1 via sheet flow, storm drain, & vegetated swales. DMA-1 is comprised of private roads, 17 ~1acre single family parcels, pathways, vineyards, disturbed and undisturbed pervious areas that also drain to BR-1. The total proposed impervious area is 65,020 square feet.

DMA-2 totaling 9,494 square feet, drains to and existing roadside ditch on Mora Ave via sheet flow. DMA-2 is comprised of a private access road. The total proposed impervious area is 6,394 square feet. As the site is constrained by the existing slope, neighboring properties on either side, and width requirements; BR-1 within DMA-1 has been sized to accommodate the necessary additional retention for DMA-2.

B. Tabulation and Sizing Calculations

DMA-1 will drain to the proposed bioretention facility, BR-1, which has been sized to account for 4% of the total proposed impervious area of DMA-1 and DMA-2. See table below for bioretention sizing.

Areas Draining to Bioretention Facilities:

DMA Name	Area (SF)	Post-Project Surface Type	Runoff Factor	Area x Runoff Factor	Facility Name		
					BR-1		
DMA-1	58,586	Roads & pathways	1	58,586	Sizing Factor	Minimum Facility Size [SF]	Proposed Facility Size [SF]
Total>				58,586	0.04	2,343	2,600
DMA Name	**Area (SF)**	**Post-Project Surface Type**	**Runoff Factor**	**Area x Runoff Factor**	**Facility Name**		
					BR-1		
DMA-2	6,394	Road	1	6,394	Sizing Factor	Minimum Facility Size [SF]	Proposed Facility Size [SF]
Sub-Total <DMA-2>				6,394	0.04	256	Offset
Sub-Total <DMA-1>				58,586	0.04	2,343	
Total <DMA-1 & -2>				64,890	0.04	2,599	2,600

C. Drainage Routing

The design has incorporated several drainage swales, drainage inlets and storm drainpipes to intercept oncoming flows from the adjacent properties. While the historic pattern has been maintained to an extent, however, the planned inclusion of a new storm drain under Grants St, per separate plan, has made it possible to convey runoff that was once destined for neighboring properties to the proposed pipe. The redirection of flows has reduced existing flows to the west x southwest properties by approximately 6.8 CFS. Where are calculations, as provided in Appendix D 11.33 CFS pre-construction flow and with the rerouting reducing flow to 4.54 during a 10 year-storm event.

D. Drainage Analysis Methodology

The Incremental Rational Method has been used to calculate the 10-year and 100-year peak runoff in accordance with the Sonoma County Water Agency (SCWA) Flood Management Design Manual (FMDM, 2020) as shown in the 10-yr and 100-yr Incremental Rational Method Drainage Study, **see Appendix D - Exhibit 2.** Rainfall Intensity was taken from the NOAA Atlas 14, Point Precipitation Frequency Estimates and an Intensity Duration Frequency Curve (IDF Curve), **see Appendix D - Exhibit 2.** The runoff coefficients (C-value) used for the Incremental Rational Method analysis were based on the Land

Use and average slope from Table C-1 from the FMDM, 2020, **see Appendix D - Exhibit 2**.

Time of concentration (TOC) was determined by evaluating the longest anticipated conveyance within the proposed system, accounting for headwater hydrology. This was established by utilizing 15 minutes for the TOC, from Table 3-3 of the FMDM, for overland release within the initial basin(s) (Areas A2 & A3), thereafter calculating shallow concentrated flow travel time for the mean shallow flow path (Area A4), from Table 3-5 / equations 3.5 & 3.6 from the FMDM. The flow was then calculated as channelized/pipe flow, where it is expected to flow through basin's existing thalweg to a proposed swale within area A9, with calculation 3.8 of the FMDM, equation 3.8 was then utilized iteratively down the proposed storm drain system until confluence with the second largest basin of the tributary. The TOC established at such point was then applied to the ancillary basins and no further time was provided to the system as a means of conservation. The total calculated/applied TOC was 38 minutes and 32 seconds, see calculations accompanying **Appendix D - Exhibit 2.** The Hydrologic Soil group for the project soil type is presented in **Appendix D - Exhibit 4 Soil Analysis**.

Hydraulic Toolbox 4.4 was used to calculate the normal depth in conveyance facilities. Hydraulics have been calculated using a Manning's roughness of 0.035 for grass lined swales, 0.050 for rock lines swales, and 0.012 for all pipes. The results indicate that the proposed drainage system has been sized to convey the design 10-yr flows adequately, **see Appendix D - Exhibit 3.**

V. Source Control Measures

Potential Source of Runoff Pollutants	Structural Source Controls	Operational Source Control BMPs
Landscape/Outdoor Pesticide use	*See statement below*	Maintain landscaping using no pesticides. See applicable operation BMPs in Fact Sheet SC-41 "Building and Grounds Maintenance" in the CASQA Stormwater Quality Handbook.
Private Road & Eva Access Road	Drains across vegetation and into Bioretention Facility	Prevent accumulation of litter and debris. Maintain swales and bioretention facilities.

For landscaped areas, existing trees and vegetation will be maintained to the maximum extent practicable. Landscaped areas will be designed such that the use of pesticides will not be required. Refer to the Integrated Pest Management information for proper use of pesticides before use.

VI. Stormwater Facility Maintenance

The owner will be required to sign a maintenance agreement with the City of Calistoga for proper maintenance of all BMPs and submit annual maintenance reports to the City in compliance with the City's NPDES requirements.

Based on current costs of installation, we anticipate that the maintenance cost over an annual period for the proposed LID features will be $1.00 per square foot for a total of $7,430 per year. Since Adobe Associates, Incorporated, has no control over the cost of labor, materials, or equipment, or the contractor's methods of determining prices, or market conditions, our opinions of probable maintenance cost provided herein are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the construction industry. Adobe Associates, Incorporated cannot, and does not, guarantee that the cost will not vary over time as of the date of this report.

The owner shall be the party responsible for costs associated with Operations and Maintenance of the vegetated areas until such time that this responsibility is transferred to a subsequent owner.

Some maintenance requirements for the landscape areas will include general cleanup to remove any trash and debris that has collected, prune plants, maintain the design surface elevation, control weeds using manual methods or natural herbicides, and add mulch as needed.

VII. Construction Checklist

Page # in Stormwater Control Plan	Source Control/Treatment Control Measure	Plan Sheet #
3	Landscape/Outdoor pesticide use	N/A
3	Private Roads	C3.0, C4.0

VIII. Certifications

The design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the BASMAA Post-Construction Manual.

Appendix A
Vicinity Map

Vicinity Map

2400 Grant Street, Calistoga

N

Appendix B
Stormwater Management Plan Exhibit

NOTE:

REFER TO SUBMITTED GRADING & DRAINAGE PLANS FOR INVERTS, FLOW LINES, TOP OF GRATE ELEVATIONS AND DRAINAGE SPECIFICATIONS

DRAINAGE AREA TABLE

DMA-1 = 762,428 SF

DMA-2 = 9,494 SF

DRAINAGE AREA LEGEND

- DMA1 — DRAINAGE MANAGEMENT AREA
- DRAINAGE AREA BOUNDARY
- PROPERTY LINE (P)
- DIRECTION OF FLOW

DRAINAGE ROUTING

DMA1 → BR-1

DMA 2 → OFFSET

Impervious Area Summary		
Site Feature	Square Footage	Notes
Private Roads	43,840	24' wide access road
Pathways	6,955	5' wide pathways
Misc	2,000	Safety Factor
Total Square Footage	52,795	SF
Min. Bioretension Size (4%)	2,112	SF
Provided Bioretention Size	2,413	SF

GARNETT CREEK CT

APN 011-500-006

APN 011-500-005

APN 011-500-004

APN 011-010-016

APN 011-351-026

APN 011-351-042

APN 011-351-043

GRANT STREET

DMA1

PROPOSED BIORETENTION FACILITY (BR-1), 2,413 SF

APN 011-021-018

APN 011-021-011

APN 011-021-002

APN 011-021-014

APN 011-021-013

APN 011-021-006

APN 011-021-007

APN 011-021-008

APN 011-021-009

DMA2

Ex Ditch

Approximate Location of Drainage Ditch Flowline

MORA AVENUE

HATCHING LEGEND

- IMPERVIOUS AREA
- BIORETENTION FACILITY

50' 25' 0 25' 50' 100' 150'

Graphic Scale: 1" = 50'

April 24, 2025

STORM WATER CONTROL PLAN

2400 Grant Street Subdivision
2400 Grant Street, Calistoga, CA
APN 011-010-057

adobe associates, inc.
civil engineering | land surveying | wastewater
1220 N. Dutton Ave., Santa Rosa, CA 95401
P. (707) 541-2300 F. (707) 541-2301
Website: www.adobeinc.com
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T:\2023 PROJECTS\23270\dwg\Adobe-Design\Tentative Map\Drainage Exhibits\23270 - Stormwater Control Plan.dwg, Doron Lewis, 4/24/2025 6:11:43 PM

Appendix C

Maintenance Agreement for Monitoring Stormwater BMP Facilities and Declaration of Covenants

Exhibit A
Property Legal Description

EXHIBIT "A"

Escrow Number: 00099368-LT

Commencing at a point on the northeastern line of Grant street, distance thereon South 59 degrees East 20.045 chains from the point intersection thereof with the southeastern line of Greenwood Avenue, running thence along said line of Grant Street, South 59 degrees East 8.005 chains; thence North 30 ¼ degrees East 22.37 chains; thence North 58 3/4 degrees West 8.005 chains, and thence South 30 ¼ degrees West 22.37 chains, more or less, to the point of commencement.

Being Lot 3 and a portion of Lot 4 as the same are shown upon that certain map entitled "Map W.F. Fisher Tract, Calistoga, Napa Co. Cal.", filed April 17, 1897 in the office of the County Recorder of said Napa County.

EXCEPTING THEREFROM the following described parcel:

Beginning at a point on the southeasterly line of the lands of Ira S. Carter and Lois J. Carter, Trustees of the CARTER FAMILY TRUST dated October 1, 2001 as described by deed recorded October 10, 2001 under Document Number 2001-0035326, Napa County Records, from which point an untagged 3/4" inch iron pipe marking the most northerly corner of the lands of 1881 Mora, LLC as described by deed recorded July 18, 2002 under Document Number 2002-0028547, Napa County Records, and as said lands are shown and delineated on "Map No. 5442, Record of Survey" filed December 11, 2002 in Book 35 of Surveys, Page 26, Napa County Records, bears N 29°56'29" E, 30.00 feet; thence from said point of beginning and along said southeasterly line S 29°56'29" W, 413.13 feet, to a ¾ inch iron pipe tagged PLS 5769, marking the most westerly corner of said lands of 1881 Mora, LLC; thence leaving said southeasterly line of the lands of the CARTER FAMILY TRUST, N 60°03'31" W, 19.65 feet; thence parallel with and 19.65 feet northwesterly from, measured at right angles to, the southeasterly line of said lands of the CARTER FAMILY TRUST, N 29°56'29" E, 413.17 feet, to a point from which the point of beginning bears S 59°57'07" E, 19.65 feet; thence S 59°57'07" E, 19.65 feet, to the point of beginning. Containing 8118 square feet, more or less.

TOGETHER WITH the following described parcel:

Beginning at an untagged 3/4 inch iron pipe marking the most northerly corner of the lands of 1881 Mora, LLC as described by deed recorded July 18, 2002 under Document Number 2002-0028547, Napa County Records, as said lands are shown and delineated on "Map No. 5442, Record of Survey" filed December 11, 2002 in Book 35 of Surveys, Page 26, Napa County Records; thence from said point of beginning and along the northeasterly line of said lands of 1881 Mora, LLC, S 59°57'07" E, 270.61 feet, to a ¾ inch iron pipe tagged PLS 5769, marking the most easterly corner of said lands of 1881 Mora, LLC, and from which point a nail and tag PLS 5769 in the centerline of Mora Avenue, bears S 59°57'07" E, 25.00 feet; thence along the southeasterly line of said lands of 1881 Mora, LLC, S 29°59'00" W, 30.00 feet; thence leaving said southeasterly line, parallel with and 30.00 feet southwesterly from, measured at right angles to, the northeasterly line of said lands of 1881 Mora, LLC, N 59°57'07" W, 270.59 feet, to a point in the northwesterly line of said lands of 1881 Mora, LLC; thence along said northwesterly line, N 29°56'29" E, 30.00 feet, to the point of beginning. Containing 8118 square feet, more or less.

APN: 011-010-057

April 24, 2025

EXHIBIT A - LEGAL DESCRIPTION

2400 Grant Street, Calistoga, CA
APN 011-010-057

adobe associates, inc.
civil engineering | land surveying | wastewater
1220 N. Dutton Ave., Santa Rosa, CA 95401
P. (707) 541-2300 F. (707) 541-2301
Website: www.adobeinc.com
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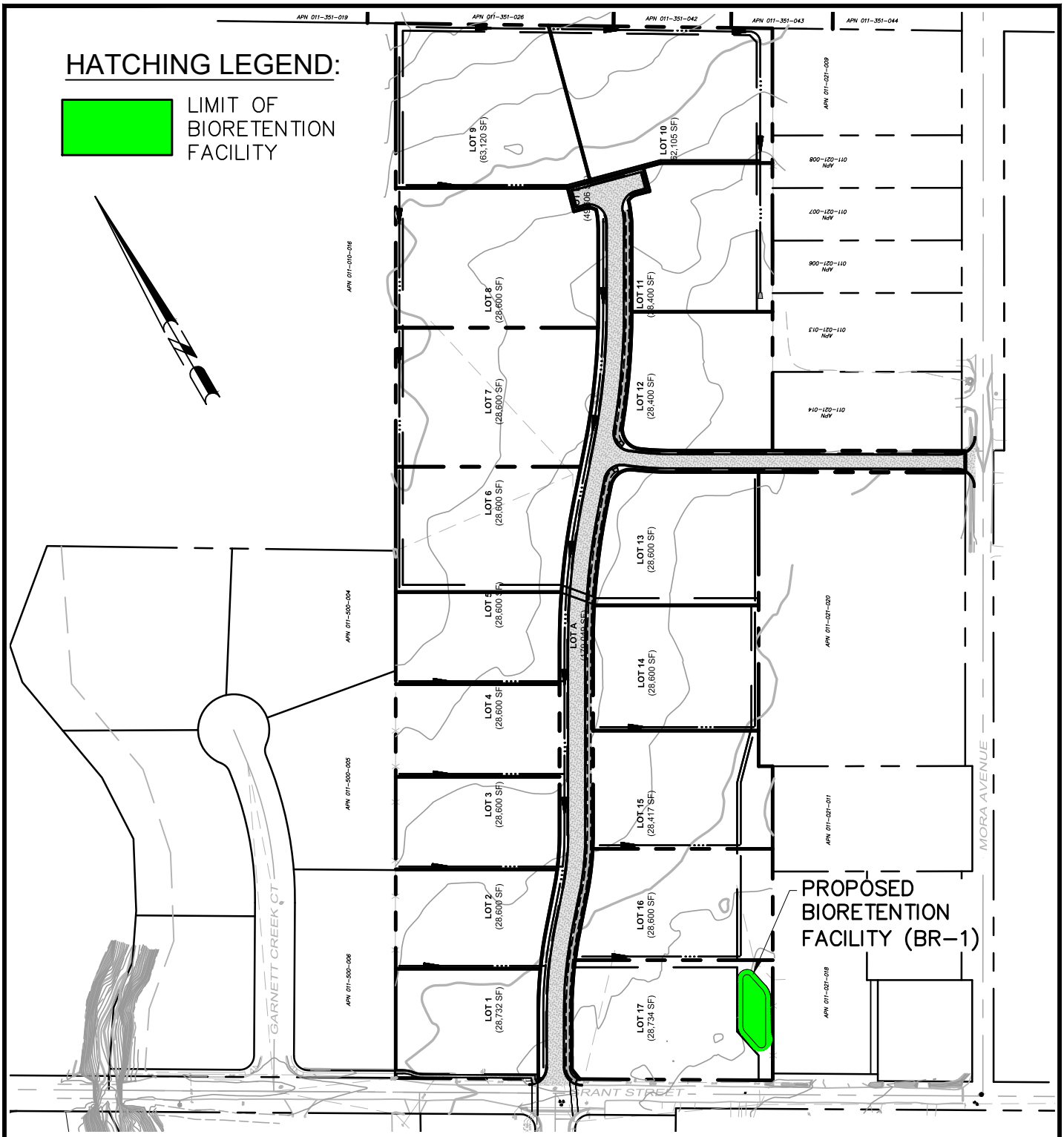
Exhibit B
BMP Location Map as Part of This Agreement



April 24, 2025

EXHIBIT B - BMP LOCATION

2400 Grant Street, Calistoga, CA
APN 011-010-057

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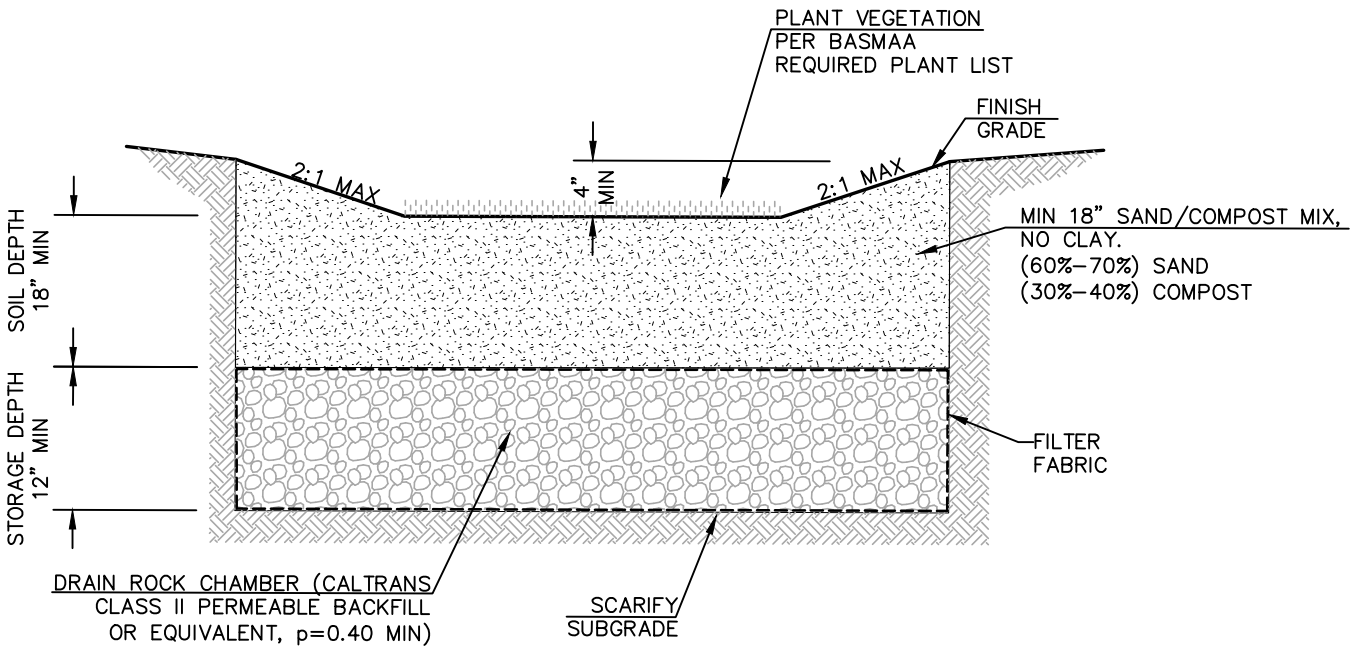
Exhibit B.1
BMP Detail



1 BIORETENTION FACILITY

NTS

April 24, 2025

EXHIBIT B.1 - BIORETENTION FACILITY DETAIL

2400 Grant Street, Calistoga, CA
APN 011-010-057

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Exhibit C
Operation and Maintenance Plan

I. Introduction

A. Site Description

The project is located at 2400 Grant Street in Calistoga, California. The parcel size is approximately 17.97 acres and is on a gently sloping site. Total area of 52,795 SF of impervious improvements have been proposed, including 17 parcels for single family residences & a private road.

II. Designation of Responsible Individuals

A. Designated Contact for Operation and Maintenance:

Jeff Stone
PO Box 472, Lafayette
Petaluma, CA 94549
(925) 383-7122

B. Emergency Contact:

Jeff Stone
PO Box 472, Lafayette
Petaluma, CA 94549
(925) 383-7122

III. Facilities to be Maintained

A. Facility Description

There is one bioretention facility on the site. All have the following features:

- Min. 12 inches of Class 2 permeable, Caltrans specification 68-2.02F (3).
- Min. 18 inches sand/compost mix.
- Min. 6-inch-deep reservoir between top of soil elevation and top of bank.
- Planting (per BASMAA standards).

I. Bioretention Facilities

There is one bioretention facility on the site. Bioretention facilities are graded to be level and contain an 18" thick layer of sand/compost mix to provide stormwater treatment with a 12" thick layer of class 2 permeable base rock below it, to provide stormwater retention. Maintain facility using no pesticides or fertilizer. See applicable operation BMPs in Fact Sheet SC-41 "Building and Grounds Maintenance" in the CASQA Stormwater Quality Handbook.

1. Bioretention Facility-1 (BR-1)

BR-1 receives runoff from DMA-1, totaling 64,890 SF of impervious area, which includes the proposed roadway & pathways. Inflow is via sheet flow, storm drains, & vegetated swales. The required bioretention facility size for DMA-1 is 4,599 SF.

IV. Record Drawing of Grading and Drainage Plans

Copies of "As-Built" construction drawings including facilities "As-Built" can be viewed at the Survey & Land Development Section at the Sonoma County Permit & Resources Management Department.

V. Schedule of Maintenance Activities

Some maintenance requirements for the drainage system will include general cleanup to remove any trash and debris that has collected, pruning plants to maintain the design surface elevation, control of weeds using manual methods or natural herbicides, and adding mulch as needed. We estimate annual maintenance costs will be in the range of $8,000 to $9,000.

Table 1: BMP Inspection and Maintenance Schedules

Inspection Activity	Every 24 Hours During Storm Event	Monthly	Bi-Annual (Oct/April)	As Needed
1. Inspect Bio-retention Facility	x	x		
2. Inspect Inlets	x	x		
3. Inspect Outlets	x	x		
4. Inspect Landscape Areas			x	

The stormwater treatment facilities extend from where stormwater flows into a swale or storm drain inlet to where it is discharged from a bio-retention facility. However, a blockage in the storm drain system will cause water to back up and not flow into the proposed bio-retention facility. For this reason, inspection and maintenance of the storm drain system is considered part of the inspection and maintenance of the bio-retention facility. Normal functioning of these areas may involve retention of water for up to 72 hours following significant storm events.

STORM DRAIN SYSTEM

Frequency	Observation	Maintenance Activity
Before each rainy season and as stated in Table 1.	Inspect the storm drain outfall. Look for obstructions, vegetation, debris, litter, sediment, etc. blocking the outfall. Check for bushes, trees, or other dense vegetation growing immediately in front of the outfall.	Remove obstructions, etc.
Before each rainy season and after the first heavy rain.	Inspect the entire storm drain system from the upstream end to the outfall. Observe the flow of water. Any evidence of ponding in the inlets indicates a blockage.	Find and remove any obstructions. Flushing may be necessary.

BIO RETENTION FACILITY

Frequency	Observation	Maintenance Activity
Before each rainy season and as stated in Table 1.	Inspect inlets & overflows.	Remove any soil or debris blocking planter inlets or overflows. Remove trash that typically collects near inlets or gets caught in vegetation
	Inspect basin.	Prune or cut back plants for health and to ensure flow into inlets and across the surface of the facility. Remove and replant as necessary. When replanting, maintain the design surface elevation and minimize the introduction of soil

Appendix D
Hydrological & Hydraulic Calculations

Exhibit 1
Existing & Proposed Hydrology Maps

NOTE:

1-FT & 5-FT CONTOURS SHOWN ARE FROM LIDAR AND ARE SHOWN FOR GRAPHIC PURPOSES ONLY

REFER TO SUBMITTED GRADING & DRAINAGE PLANS FOR INVERTS, FLOW LINES, TOP OF GRATE ELEVATIONS AND DRAINAGE SPECIFICATIONS

THIS MAP IS FOR REFERENCE ONLY

GARNETT CREEK

GRANT STREET

Ex A1

Ex A2

Ex A3

Ex Catch Basin (approx.) flows to creek

Ex Drainage Inlet (approx.) flows to creek

Ex Cutoff Swale

Ex Structure

Ex Vinerows

383.9 EG

386.3 EG

389.2 EG

393.2 EG

400.1 EG

404.3 EG

379.9 EG

382.4 EG

382.3 EG

383.6 EG

387.6 EG

80' 40' 0 40' 80' 160' 240'

Graphic Scale: 1" = 80'

DRAINAGE AREA LEGEND

Ex A1	DRAINAGE AREA (EXISTING)
1	POINT OF CONCENTRATION
	DRAINAGE AREA BOUNDARY
	LINE-OF-ANALYSIS
	DIRECTION OF FLOW
	SUBBASIN LONGEST WATER COURSE

DRAINAGE AREA TABLE

Ex A1 = 33.31 AC (1,450,955 SF)

Ex A2 = 7.03 AC (306,239 SF)

Ex A3 = 6.53 AC (284,639 SF)

DRAINAGE ROUTING

Ex A3 → 3 | Ex A2 → 2 | Ex A1 → 1

EXISTING HYDROLOGY MAP

2400 Associates LLC
2400 Grant Street, Calistoga
APN 011-010-057

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Website: www.adobeinc.com
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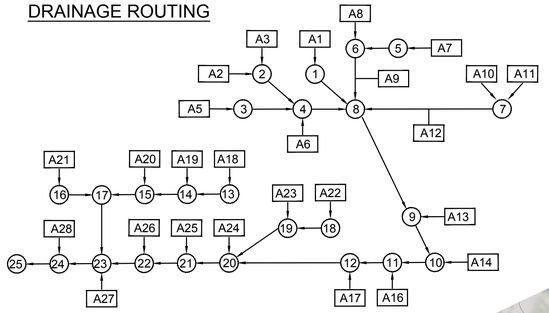
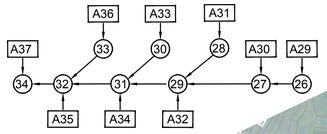
DRAINAGE ROUTING





GARNETT CREEK

GRANT STREET

PROPOSED ROADWAY

PROPOSED WALKWAY

Ex Structure

Ex Vinerows

Ex Roadside Cutoff Swale

Ex Catch Basin (approx.) flows to creek

Ex Drainage Inlet (approx.) flows to creek

DI-14 AT BIORETNTION

SWALE-9

SWALE-8

SWALE-7

SWALE-6

SWALE-14

SWALE-15

SWALE-13

SWALE-12

SWALE-11

SWALE-10

SWALE-1

SWALE-2

SWALE-3

SWALE-4

SD-1 SD-2 SD-3 SD-4 SD-5 SD-6 SD-7 SD-8 SD-9 SD-10 SD-11 SD-12 SD-13 SD-14

DI-1 DI-2 DI-3 DI-4 DI-5 DI-6 DI-7 DI-8 DI-9 DI-10 DI-11 DI-12 DI-13

HATCHING LEGEND:

- 4" AC OVER 9" CL II AB
- 2" DOUBLE CHIP SEAL OVER CL II AB
- 4" PCC OVER 4" CL II AB
- BIORETENTION AREA

DRAINAGE AREA LEGEND

- A1 — DRAINAGE AREA
- (1) — POINT OF CONCENTRATION
- DRAINAGE AREA BOUNARY
- LINE-OF-ANALYSIS
- DIRECTION OF FLOW

80' 40' 0 40' 80' 160' 240'

Graphic Scale: 1" = 80'

NOTE:

1-FT & 5-FT CONTOURS SHOWN ARE FROM LIAR AND ARE SHOWN FOR GRAPHIC PURPOSES ONLY

REFER TO SUBMITTED GRADING & DRAINAGE PLANS FOR INVERTS, FLOW LINES, TOP OF GRATE ELEVATIONS AND DRAINAGE SPECIFICATIONS

THIS MAP IS FOR REFERENCE ONLY

PROPOSED HYDROLOGY MAP

2400 Associates LLC
2400 Grant Street, Calistoga
APN 011-010-057

adobe associates, inc.
civil engineering | land surveying | wastewater
1220 N. Dutton Ave., Santa Rosa, CA 95401
P. (707) 541-2300 F. (707) 541-2301
Website: www.adobeinc.com
"A Service You Can Count On!"

T:\2023 PROJECTS\23270\dwg\Adobe-Design\Exhibits\23270_Proposed Hydrology Map.dwg, Doron Lewis, 5/21/2025 2:49:00 PM

Exhibit 2

Incremental Rational Method Drainage Study
& Associated Calculations / Reference Material

Incremental Rational Method Drainage Study

10 -Yr Storm Event Post Construction

Project: 23270- 2400 Grant Street **Date:** 5/21/2025

Point of Concentration	Area	Elevation	Distance	Slope	V(ft/s)	Travel Time (min)	Total Time (min)	I	C	A	A_{total}	AC	Sum AC	Q (cfs)	Remarks
10 year															
ON SITE FLOW RATES															
1	A 1	-	-	-	-	7.00	7.00	2.74	0.28	0.41	0.41	0.11	0.11	0.31	Total Flow to SWALE-1, DI,1 & SD-1
2	A 2	-	-	-	-	15.00	15.00	1.90	0.28	1.85	1.85	0.52	0.52	0.98	Overland Flow to POC 2
2	A 3					15.00	15.00	1.90	0.28	2.30	2.30	0.65	0.65	1.23	Overland Flow to POC 2
5	A 4	6.7	478	0.014	1.91	4.17	19.17	1.69	0.28	2.15	2.15	0.60	0.60	1.02	Shallow Concentrated Flow to A9
						15+4.17=19.17									
5								Combines A2, A3, & A4						3.23	Overland Flow to A4
3	A 5	-	-	-	-	15.00	19.17	1.69	0.28	0.64	0.64	0.18	0.18	0.30	Overland Flow to A6
5	A 6	4.2	254	0.017	2.07	2.07	19.17	1.69	0.28	0.78	0.78	0.22	0.22	0.37	Shallow Concentrated Flow to A9
5								Combines POC 2, 3, & 4						3.91	Shallow Concentrated Flow to A9
4	A 7	-	-	-	-	15.00	19.17	1.69	0.47	0.82	0.82	0.39	0.39	0.65	Overland Flow to A8
5	A 8	7.5	610	0.012	1.79	1.79	19.17	1.69	0.28	2.06	2.06	0.58	0.58	0.98	Shallow Concentrated Flow to A9
5								Combines POC 5 & 6						5.54	Shallow Concentrated Flow to A9
						See Calculations*									
6	A 9	-	-	-	-	8.22	27.39	1.43	0.28	1.22	1.22	0.34	0.34	0.49	Overland Flow to SWALE-2
						19.17+8.22=27.39									
8								Combines POC 2, 3, 4, 5, & 6						6.03	Total Flow to SWALE-2, Total Swale Flow to DI-2
7	A 10	-	-	-	-	15.00	27.39	1.43	0.28	1.38	1.38	0.39	0.39	0.55	Overland Flow to A12
7	A 11	-	-	-	-	15.00	27.39	1.43	0.28	2.28	2.28	0.64	0.64	0.91	Overland Flow to A12
8	A 12	5	769	0.007	1.30	1.30	27.39	1.43	0.28	2.59	2.59	0.73	0.73	1.04	Shallow Flow to DI-2
8								Combines POC 7 & 8						8.53	Total Flow to DI-2
8								Combines POC 1, 7, & 8						8.84	Total Flow to SD-2
						See Calculations*									
9	A 13	-	-	-	-	7.24	34.63	1.28	0.28	1.08	1.08	0.30	0.30	0.39	Total Flow to SWALE-3 & DI-3
9						3.90		Combines POC 8 & 9						9.23	Total Flow to SD-3
10	A 14	-	-	-	-	15.00	38.53	1.22	0.28	1.99	1.99	0.56	0.56	0.68	Total Flow to SWALE-4 & DI-4
						34.63+3.90=38.53									
10								Combines POC 9 & 10						9.91	Total Flow to SD-4
11	A 16	-	-	-	-	15.00	38.53	1.22	0.47	0.57	0.57	0.27	0.27	0.32	Total Flow to DI-5
11								Combines POC 10 & 11						10.23	Total Flow to SD-5

Point of Concentration	Area	Elevation	Distance	Slope	V(ft/s)	Travel Time (min)	Total Time (min)	I	C	A	A_{total}	AC	Sum AC	Q (cfs)	Remarks
12	A 17	-	-	-	-	10.00	38.53	1.22	0.47	0.21	0.21	0.10	0.10	0.12	Total Flow to DI-6
12								Combines POC 11 & 12						10.35	Total Flow to SD-6
13	A 18	-	-	-	-	15.00	38.53	1.22	0.28	1.97	1.97	0.55	0.55	0.67	Total Flow to SWALE-6
14	A 19	-	-	-	-	15.00	38.53	1.22	0.28	1.73	1.73	0.48	0.48	0.59	Overland Flow to SWALE-7
14								Combines POC 13 & 14						1.26	Total Flow to SWALE-7
15	A 20	-	-	-	-	15.00	38.53	1.22	0.28	1.14	1.14	0.32	0.32	0.39	Overland Flow to SWALE-8
15								Combines POC 14 & 15						1.65	Total Flow to SWALE-8
16	A 21	-	-	-	-	15.00	38.53	1.22	0.28	2.98	2.98	0.84	0.84	1.02	Total Flow to SWALE-9
17								Combines POC 14, 15, & 16						2.66	Total Flow to DI-12 & SD-12
18	A 22	-	-	-	-	15.00	38.53	1.22	0.28	0.94	0.94	0.26	0.26	0.32	Total Flow to SWALE-10
18								Combines POC 12 & 18						10.67	Total Flow to DI-7 & SD-7
19	A 23	-	-	-	-	15.00	38.53	1.22	0.28	0.93	0.93	0.26	0.26	0.32	Overland Flow to DI-8
19								Combines POC 18 & 19						10.99	Total Flow to DI-8 & SD-8
20	A 24	-	-	-	-	10.00	38.53	1.22	0.47	0.40	0.40	0.19	0.19	0.23	Overland Flow to DI-9
20								Combines POC 19 & 20						11.22	Total Flow to SD-9
21	A 25	-	-	-	-	10.00	38.53	1.22	0.47	0.28	0.28	0.13	0.13	0.16	Total Flow to DI-10
21								Combines POC 20 & 21						11.38	Total Flow to SD-10
22	A 26	-	-	-	-	15.00	38.53	1.22	0.47	0.94	0.94	0.44	0.44	0.53	Overland Flow to DI-11
22								Combines POC 21 & 22						11.91	Total Flow to SD-11
23	A 27	-	-	-	-	15.00	38.53	1.22	0.47	0.53	0.53	0.25	0.25	0.30	Overland Flow to DI-13
23								Combines POC 17 & 23						2.97	Total Flow to DI-13 & SD-13
24	A 28	-	-	-	-	10.00	38.53	1.22	0.47	0.41	0.41	0.19	0.19	0.24	Overland Flow to DI-14 & SD-14
24								Combines POC 23 & 24						15.12	Total Flow to Bioretention, DI-14, & SD-14
26	A 29	-	-	-	-	15.00	38.53	1.22	0.28	1.45	1.45	0.41	0.41	0.49	Overland Flow to A30
27	A 30	-	-	-	-	15.00	38.53	1.22	0.28	3.08	3.08	0.86	0.86	1.05	Overland Flow toSWALE-11
27								Combines POC 26 & 27						1.54	Total Flow to SWALE-11
28	A 31	-	-	-	-	10.00	38.53	1.22	0.28	0.40	0.40	0.11	0.11	0.14	Overland Flow to A32
29	A 32	-	-	-	-	15.00	38.53	1.22	0.28	1.84	1.84	0.51	0.51	0.63	Overland Flow to SWALE-12
29								Combines POC 27, 28, & 29						2.30	Total Flow to SWALE-12
30	A 33	-	-	-	-	15.00	38.53	1.22	0.28	0.57	0.57	0.16	0.16	0.19	Overland Flow to A34
31	A 34	-	-	-	-	15.00	38.53	1.22	0.28	0.92	0.92	0.26	0.26	0.31	Overland Flow to SWALE-13
31								Combines POC 29, 30, & 31						2.81	Lateral Inflow to SWALE-13
32	A 35	-	-	-	-	15.00	38.53	1.22	0.47	0.54	0.54	0.25	0.25	0.31	Overland Flow to SWALE-13
32								Combines POC 31 & 32						3.12	Total Flow to SWALE-13
33	A 36	-	-	-	-	15.00	38.53	1.22	0.47	1.85	1.85	0.87	0.87	1.06	Overland Flow to SWALE-14 & SWALE-15
33								POC 33						1.06	Total Flow to SWALE-14
34	A 37	-	-	-	-	15.00	38.53	1.22	0.47	0.64	0.64	0.30	0.30	0.37	Overland Flow to SWALE-15
34								Combines POC 32, 33, & 34						4.54	Total Flow to SWALE-15
Ex 1	Ex A 1	-	-	-	-	15.00	38.53	1.22	0.28	33.31	33.31	9.33	9.33	11.33	Overland Flow to SWALE-15
Ex 1								From Existing Hydrology Map						11.33	Total Flow to SWALE-15

POST

PRE

ON SITE - POST CONSTRUCTION RUNOFF COEFFICIENT

DRAINAGE AREA	ACRES	C	t (min)	LAND USE*	SOIL TYPE	AVE SLOPE (%)
A 1	0.41	0.28	7.00	R	B	0-2
A 2	1.85	0.28	15.00	R	B	0-2
A 3	2.30	0.28	15.00	R	B	0-2
A 4	2.15	0.28	15.00	R	B	0-2
A 5	0.64	0.28	15.00	R	B	0-2
A 6	0.78	0.28	15.00	R	B	0-2
A 7	0.82	0.47	15.00	LD	B	0-2
A 8	2.06	0.28	15.00	R	B	0-2
A 9	1.22	0.28	15.00	R	B	0-2
A 10	1.38	0.28	15.00	R	B	0-2
A 11	2.28	0.28	15.00	R	B	0-2
A 12	2.59	0.28	15.00	R	B	0-2
A 13	1.08	0.28	15.00	R	B	0-2
A 14	1.99	0.28	15.00	R	B	0-2
~~A 15~~	~~N/A~~	~~0.00~~	~~0.00~~	~~LD~~	~~B~~	~~0-2~~
A 16	0.57	0.47	15.00	LD	B	0-2
A 17	0.21	0.47	10.00	LD	B	0-2
A 18	1.97	0.28	15.00	R	B	0-2
A 19	1.73	0.28	15.00	R	B	0-2
A 20	1.14	0.28	15.00	R	B	0-2
A 21	2.98	0.28	15.00	R	B	0-2
A 22	0.94	0.28	15.00	R	B	0-2
A 23	0.93	0.28	15.00	R	B	0-2
A 24	0.40	0.47	10.00	LD	B	0-2
A 25	0.28	0.47	10.00	LD	B	0-2
A 26	0.94	0.47	15.00	LD	B	0-2
A 27	0.53	0.47	15.00	LD	B	0-2
A 28	0.41	0.47	10.00	LD	B	0-2
A 29	1.45	0.28	15.00	R	B	0-2
A 30	3.08	0.28	15.00	R	B	0-2
A 31	0.40	0.28	10.00	R	B	0-2
A 32	1.84	0.28	15.00	R	B	0-2
A 33	0.57	0.28	15.00	R	B	0-2
A 34	0.92	0.28	15.00	R	B	0-2
A 35	0.54	0.47	15.00	LD	B	0-2
A 36	1.85	0.47	15.00	LD	B	0-2
A 37	0.64	0.47	15.00	LD	B	0-2

***Land Use Designation**

HD - High Density
LD - Low Density
MD - Medium Density
MLD - Medium/Low Density
R - Rural
B/C - Business or Commercial
I - Industrial
P - Parks and Recreation
AG - Agricultural or Open Space

Reference Table C-1 of the Sonoma County FMDM, 2020.

Rainfall Intensity vs Duration

$$I = 6.91 / t^{0.476}$$

I = intensity (in/hour)

t = time of concentration (minutes)

Incremental Rational Method Drainage Study

100 -Yr Storm Event Post Construction

Project: 23270- 2400 Grant Street **Date:** 5/21/2025

Point of Concentration	Area	Elevation	Distance	Slope	V(ft/s)	Travel Time (min)	Total Time (min)	I	C	A	A_{total}	AC	Sum AC	Q (cfs)	Remarks
100 year															
ON SITE FLOW RATES															
1	A 1	-	-	-	-	7.00	7.00	3.94	0.28	0.41	0.41	0.11	0.11	0.45	Total Flow to SWALE-1, DI,1 & SD-1
2	A 2	-	-	-	-	15.00	15.00	2.74	0.28	1.85	1.85	0.52	0.52	1.42	Overland Flow to POC 2
2	A 3					15.00	15.00	2.74	0.28	2.30	2.30	0.65	0.65	1.77	Overland Flow to POC 2
5	A 4	6.7	478	0.014	1.91	4.17	19.17	2.44	0.28	2.15	2.15	0.60	0.60	1.47	Shallow Concentrated Flow to A9
						15+4.17=19.17									
5								Combines A2, A3, & A4						4.65	Overland Flow to A4
3	A 5	-	-	-	-	15.00	19.17	2.44	0.28	0.64	0.64	0.18	0.18	0.44	Overland Flow to A6
5	A 6	4.2	254	0.017	2.07	2.07	19.17	2.44	0.28	0.78	0.78	0.22	0.22	0.53	Shallow Concentrated Flow to A9
5								Combines POC 2, 3, & 4						5.62	Shallow Concentrated Flow to A9
4	A 7	-	-	-	-	15.00	19.17	2.44	0.47	0.82	0.82	0.39	0.39	0.94	Overland Flow to A8
5	A 8	7.5	610	0.012	1.79	1.79	19.17	2.44	0.28	2.06	2.06	0.58	0.58	1.40	Shallow Concentrated Flow to A9
5								Combines POC 5 & 6						7.96	Shallow Concentrated Flow to A9
						See Calculations*									
6	A 9	-	-	-	-	8.22	27.39	2.05	0.28	1.22	1.22	0.34	0.34	0.70	Overland Flow to SWALE-2
						19.17+8.22=27.39									
8								Combines POC 2, 3, 4, 5, & 6						8.67	Total Flow to SWALE-2, Total Swale Flow to DI-2
7	A 10	-	-	-	-	15.00	27.39	2.05	0.28	1.38	1.38	0.39	0.39	0.79	Overland Flow to A12
7	A 11	-	-	-	-	15.00	27.39	2.05	0.28	2.28	2.28	0.64	0.64	1.31	Overland Flow to A12
8	A 12	5	769	0.007	1.30	1.30	27.39	2.05	0.28	2.59	2.59	0.73	0.73	1.49	Shallow Flow to DI-2
8								Combines POC 7 & 8						12.26	Total Flow to DI-2
8								Combines POC 1, 7, & 8						12.71	Total Flow to SD-2
						See Calculations*									
9	A 13	-	-	-	-	7.24	34.63	1.84	0.28	1.08	1.08	0.30	0.30	0.56	Total Flow to SWALE-3 & DI-3
9						3.90		Combines POC 8 & 9						13.27	Total Flow to SD-3
10	A 14	-	-	-	-	15.00	38.53	1.74	0.28	1.99	1.99	0.56	0.56	0.97	Total Flow to SWALE-4 & DI-4
						34.63+3.90=38.53									
10								Combines POC 9 & 10						14.24	Total Flow to SD-4
11	A 16	-	-	-	-	15.00	38.53	1.74	0.47	0.57	0.57	0.27	0.27	0.47	Total Flow to DI-5
11								Combines POC 10 & 11						14.71	Total Flow to SD-5

Point of Concentration	Area	Elevation	Distance	Slope	V(ft/s)	Travel Time (min)	Total Time (min)	I	C	A	A_{total}	AC	Sum AC	Q (cfs)	Remarks
12	A 17	-	-	-	-	10.00	38.53	1.74	0.47	0.21	0.21	0.10	0.10	0.17	Total Flow to DI-6
12								Combines POC 11 & 12						14.88	Total Flow to SD-6
13	A 18	-	-	-	-	15.00	38.53	1.74	0.28	1.97	1.97	0.55	0.55	0.96	Total Flow to SWALE-6
14	A 19	-	-	-	-	15.00	38.53	1.74	0.28	1.73	1.73	0.48	0.48	0.84	Overland Flow to SWALE-7
14								Combines POC 13 & 14						1.81	Total Flow to SWALE-7
15	A 20	-	-	-	-	15.00	38.53	1.74	0.28	1.14	1.14	0.32	0.32	0.56	Overland Flow to SWALE-8
15								Combines POC 14 & 15						2.37	Total Flow to SWALE-8
16	A 21	-	-	-	-	15.00	38.53	1.74	0.28	2.98	2.98	0.84	0.84	1.46	Total Flow to SWALE-9
17								Combines POC 14, 15, & 16						3.82	Total Flow to DI-12 & SD-12
18	A 22	-	-	-	-	15.00	38.53	1.74	0.28	0.94	0.94	0.26	0.26	0.46	Total Flow to SWALE-10
18								Combines POC 12 & 18						15.34	Total Flow to DI-7 & SD-7
19	A 23	-	-	-	-	15.00	38.53	1.74	0.28	0.93	0.93	0.26	0.26	0.46	Overland Flow to DI-8
19								Combines POC 18 & 19						15.79	Total Flow to DI-8 & SD-8
20	A 24	-	-	-	-	10.00	38.53	1.74	0.47	0.40	0.40	0.19	0.19	0.33	Overland Flow to DI-9
20								Combines POC 19 & 20						16.12	Total Flow to SD-9
21	A 25	-	-	-	-	10.00	38.53	1.74	0.47	0.28	0.28	0.13	0.13	0.23	Total Flow to DI-10
21								Combines POC 20 & 21						16.36	Total Flow to SD-10
22	A 26	-	-	-	-	15.00	38.53	1.74	0.47	0.94	0.94	0.44	0.44	0.77	Overland Flow to DI-11
22								Combines POC 21 & 22						17.12	Total Flow to SD-11
23	A 27	-	-	-	-	15.00	38.53	1.74	0.47	0.53	0.53	0.25	0.25	0.44	Overland Flow to DI-13
23								Combines POC 17 & 23						4.26	Total Flow to DI-13 & SD-13
24	A 28	-	-	-	-	10.00	38.53	1.74	0.47	0.41	0.41	0.19	0.19	0.34	Overland Flow to DI-14 & SD-14
24								Combines POC 23 & 24						21.72	Total Flow to Bioretention, DI-14, & SD-14
26	A 29	-	-	-	-	15.00	38.53	1.74	0.28	1.45	1.45	0.41	0.41	0.71	Overland Flow to A30
27	A 30	-	-	-	-	15.00	38.53	1.74	0.28	3.08	3.08	0.86	0.86	1.50	Overland Flow toSWALE-11
27								Combines POC 26 & 27						2.21	Total Flow to SWALE-11
28	A 31	-	-	-	-	10.00	38.53	1.74	0.28	0.40	0.40	0.11	0.11	0.20	Overland Flow to A32
29	A 32	-	-	-	-	15.00	38.53	1.74	0.28	1.84	1.84	0.51	0.51	0.90	Overland Flow to SWALE-12
29								Combines POC 27, 28, & 29						3.31	Total Flow to SWALE-12
30	A 33	-	-	-	-	15.00	38.53	1.74	0.28	0.57	0.57	0.16	0.16	0.28	Overland Flow to A34
31	A 34	-	-	-	-	15.00	38.53	1.74	0.28	0.92	0.92	0.26	0.26	0.45	Overland Flow to SWALE-13
31								Combines POC 29, 30, & 31						4.03	Lateral Inflow to SWALE-13
32	A 35	-	-	-	-	15.00	38.53	1.74	0.47	0.54	0.54	0.25	0.25	0.44	Overland Flow to SWALE-13
32								Combines POC 31 & 32						4.47	Total Flow to SWALE-13
33	A 36	-	-	-	-	15.00	38.53	1.74	0.47	1.85	1.85	0.87	0.87	1.52	Overland Flow to SWALE-14 & SWALE-15
33								POC 33						1.52	Total Flow to SWALE-14
34	A 37	-	-	-	-	15.00	38.53	1.74	0.47	0.64	0.64	0.30	0.30	0.52	Overland Flow to SWALE-15
34								Combines POC 32, 33, & 34						6.51	Total Flow to SWALE-15
Ex 1	Ex A 1	-	-	-	-	15.00	38.53	1.74	0.28	33.31	33.31	9.33	9.33	16.27	Overland Flow to SWALE-15
Ex 1								From Existing Hydrology Map						16.27	Total Flow to SWALE-15

POST

PRE

ON SITE - POST CONSTRUCTION RUNOFF COEFFICIENT

DRAINAGE AREA		ACRES	C	t (min)	LAND USE*	SOIL TYPE	AVE SLOPE (%)
A	1	0.41	0.28	7.00	R	B	0-2
A	2	1.85	0.28	15.00	R	B	0-2
A	3	2.30	0.28	15.00	R	B	0-2
A	4	2.15	0.28	15.00	R	B	0-2
A	5	0.64	0.28	15.00	R	B	0-2
A	6	0.78	0.28	15.00	R	B	0-2
A	7	0.82	0.47	15.00	LD	B	0-2
A	8	2.06	0.28	15.00	R	B	0-2
A	9	1.22	0.28	15.00	R	B	0-2
A	10	1.38	0.28	15.00	R	B	0-2
A	11	2.28	0.28	15.00	R	B	0-2
A	12	2.59	0.28	15.00	R	B	0-2
A	13	1.08	0.28	15.00	R	B	0-2
A	14	1.99	0.28	15.00	R	B	0-2
~~A~~	~~15~~	~~N/A~~	~~0.00~~	~~0.00~~	~~LD~~	~~B~~	~~0-2~~
A	16	0.57	0.47	15.00	LD	B	0-2
A	17	0.21	0.47	10.00	LD	B	0-2
A	18	1.97	0.28	15.00	R	B	0-2
A	19	1.73	0.28	15.00	R	B	0-2
A	20	1.14	0.28	15.00	R	B	0-2
A	21	2.98	0.28	15.00	R	B	0-2
A	22	0.94	0.28	15.00	R	B	0-2
A	23	0.93	0.28	15.00	R	B	0-2
A	24	0.40	0.47	10.00	LD	B	0-2
A	25	0.28	0.47	10.00	LD	B	0-2
A	26	0.94	0.47	15.00	LD	B	0-2
A	27	0.53	0.47	15.00	LD	B	0-2
A	28	0.41	0.47	10.00	LD	B	0-2
A	29	1.45	0.28	15.00	R	B	0-2
A	30	3.08	0.28	15.00	R	B	0-2
A	31	0.40	0.28	10.00	R	B	0-2
A	32	1.84	0.28	15.00	R	B	0-2
A	33	0.57	0.28	15.00	R	B	0-2
A	34	0.92	0.28	15.00	R	B	0-2
A	35	0.54	0.47	15.00	LD	B	0-2
A	36	1.85	0.47	15.00	LD	B	0-2
A	37	0.64	0.47	15.00	LD	B	0-2

***Land Use Designation**

HD - High Density
LD - Low Density
MD - Medium Density
MLD - Medium/Low Density
R - Rural
B/C - Business or Commercial
I - Industrial
P - Parks and Recreation
AG - Agricultural or Open Space

Reference Table C-1 of the Sonoma County FMDM, 2020.

Rainfall Intensity vs Duration

$$I = 9.99 / t^{0.478}$$

I = intensity (in/hour)

t = time of concentration (minutes)

Intensity Duration Frequency Curve (IDF Curve)

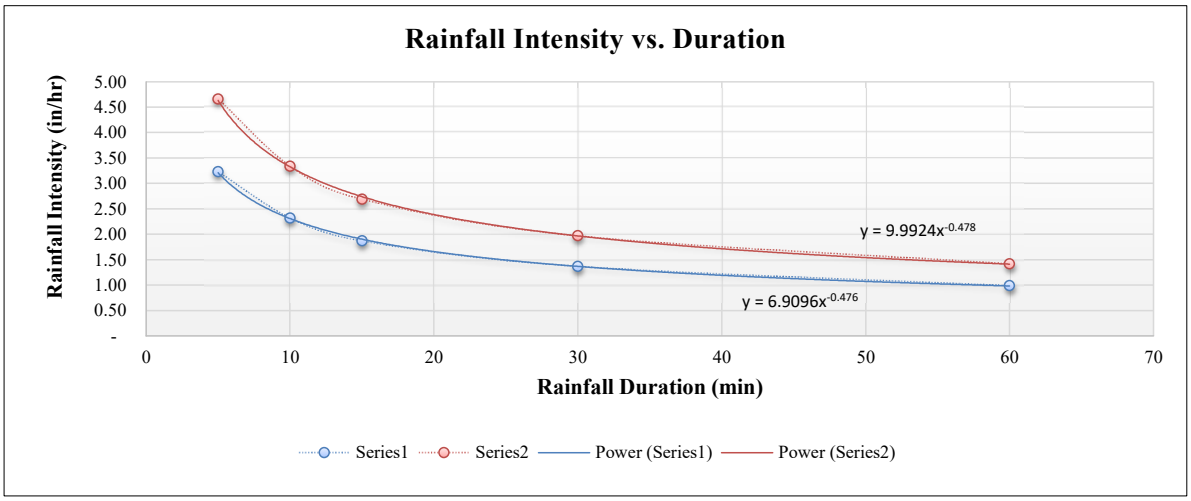
NOAA Atlas 14 Point Precipitation Frequency Estimates

https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Project: 2400 Grant St.
JN: 23270

Date: 5/21/2025
Designer: DL

Location: Calistoga, CA



NOAA Atlas 14 Data Rainfall Intensity (in/hr)		
Duration (min)	**10-yr**	**100-yr**
5	3.23	4.66
10	2.32	3.34
15	1.87	2.69
30	1.37	1.97
60	0.99	1.42

Rainfall Intensity vs Duration

$$I = a * t^{b}$$

I = intensity (in/hour)
t = time of concentration/ rainfall duration (minutes)

10-Year Trendline Values	
a =	6.910
b =	-0.476

100-Year Trendline Values	
a =	9.9924
b =	-0.478

Channel Flow Velocity Calculations

Area	Conveyance	Length	Delta	Slope	Manning's	Hydraulic	Velocity
A9	Swale-2	198	2.9	0.0146	0.035	0.57	**0.557973**
A13	SD-2	199	1	0.0050	0.012	0.395	**0.457774**
A14	SD-3	175	0.88	0.0050	0.012	0.505	**0.748495**

$$V = \left(\frac{1.49}{n}\right) * R_h^{\frac{2}{3}} * \sqrt{S}$$ *(Equation 3.8)*

Where,

- V is the average horizontal velocity in the **cross section** (ft/sec);
- n is the Manning's roughness coefficient or "Manning's n" (dimensionless);
- S is the friction slope (ft/ft); and
- R_h is the hydraulic radius (ft).

Channel Flow Travel Time Calculations

Area	Conveyance	Length	Velocity	Manning's	Travel Time (Min)
A9	Swale-3	198	0.4017	0.035	**8.22**
A13	SD-2	199	0.4578	0.012	**7.24**
A14	SD-3	175	0.7485	0.012	**3.90**

$$t_p = \frac{L_p}{V * 60}$$ *(Equation 3.10)*

Where,

- t_p is the pipe and/or channel flow travel time (min);
- L_p is the length of pipe (ft); and
- V is the velocity (ft/sec).

Table C-1. Runoff Coefficients (*Cs*) (Incremental Rational Method)

Land Use	Lot Size (acres)	Impervious Fraction	Average Slope (%)			
			0-2	>2-6	>6-12	>12
Soil Type A						
Residential[1]						
Rural		0.03	0.24	0.28	0.34	0.38
Very low density	2	0.11	0.29	0.34	0.38	0.42
	1	0.24	0.38	0.42	0.46	0.49
Low density	1/2	0.32	0.43	0.47	0.50	0.53
	1/3	0.41	0.50	0.53	0.56	0.58
Medium-low density	1/4	0.49	0.55	0.58	0.60	0.62
Medium density	1/8	0.70	0.70	0.71	0.73	0.74
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.25	0.25	0.30	0.35
Ag and open space		0.02	0.23	0.23	0.28	0.33
Soil Type B						
Residential[1]						
Rural		0.03	0.28	0.33	0.39	0.43
Very low density	2	0.11	0.34	0.38	0.43	0.47
	1	0.24	0.42	0.45	0.50	0.53
Low density	1/2	0.32	0.47	0.50	0.54	0.57
	1/3	0.41	0.53	0.56	0.59	0.61
Medium-low density	1/4	0.49	0.58	0.60	0.63	0.65
Medium density	1/8	0.70	0.71	0.73	0.74	0.76
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.25	0.30	0.34	0.40
Ag and open space		0.02	0.23	0.28	0.33	0.38
Soil Type C						
Residential[1]						
Rural		0.03	0.33	0.38	0.43	0.47
Very low density	2	0.11	0.38	0.42	0.47	0.51
	1	0.24	0.45	0.49	0.53	0.57
Low density	1/2	0.32	0.50	0.53	0.57	0.60

Land Use	Lot Size (acres)	Impervious Fraction	Average Slope (%)			
			0-2	>2-6	>6-12	>12
	1/3	0.41	0.56	0.59	0.62	0.64
Medium-low density	1/4	0.49	0.60	0.63	0.65	0.68
Medium density	1/8	0.70	0.73	0.74	0.76	0.77
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.34	0.39	0.44	0.48
Ag and open space		0.02	0.33	0.38	0.43	0.47
Soil Type D						
Residential[1]						
Rural		0.03	0.38	0.43	0.48	0.52
Very low density	2	0.11	0.42	0.47	0.52	0.55
	1	0.24	0.49	0.53	0.57	0.60
Low density	1/2	0.32	0.54	0.57	0.61	0.63
	1/3	0.41	0.59	0.62	0.65	0.67
Medium-low density	1/4	0.49	0.63	0.65	0.68	0.70
Medium density	1/8	0.70	0.74	0.76	0.77	0.78
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.39	0.44	0.49	0.53
Ag and open space		0.02	0.38	0.42	0.48	0.52

[1] *Percent impervious values are based on analysis conducted by ESA for Sonoma County Water Agency (Sonoma Water) in 2014, using a sample of existing developed areas.*

[2] *For residential areas, composite* C *values were developed as follows:* C *values for soil type from Los Angeles County Hydrology Manual (1991) were modified for slope using the vegetated areas curve from Plate B-1 of SCWA (1983) for pervious areas within a given slope range and a* C *of 0.90 for all impervious areas.*

Source: Approach adapted from McCuen 1989

NOAA Atlas 14, Volume 6, Version 2
Location name: Calistoga, California, USA*
Latitude: 38.5894°, Longitude: -122.5892°
Elevation: 383 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.90** (1.68-2.15)	**2.29** (2.04-2.60)	**2.81** (2.50-3.22)	**3.23** (2.83-3.72)	**3.79** (3.20-4.55)	**4.22** (3.48-5.18)	**4.66** (3.73-5.88)	**5.10** (3.96-6.65)	**5.70** (4.21-7.78)	**6.16** (4.38-8.74)
10-min	**1.36** (1.21-1.54)	**1.64** (1.46-1.87)	**2.02** (1.78-2.30)	**2.32** (2.03-2.67)	**2.72** (2.30-3.26)	**3.03** (2.50-3.71)	**3.34** (2.68-4.21)	**3.65** (2.84-4.76)	**4.08** (3.02-5.57)	**4.41** (3.14-6.26)
15-min	**1.10** (0.972-1.24)	**1.32** (1.18-1.51)	**1.62** (1.44-1.86)	**1.87** (1.64-2.15)	**2.19** (1.85-2.63)	**2.44** (2.01-3.00)	**2.69** (2.16-3.40)	**2.95** (2.29-3.84)	**3.29** (2.44-4.49)	**3.56** (2.53-5.04)
30-min	**0.802** (0.714-0.912)	**0.972** (0.864-1.11)	**1.19** (1.06-1.36)	**1.37** (1.20-1.58)	**1.61** (1.36-1.93)	**1.79** (1.47-2.20)	**1.97** (1.58-2.49)	**2.16** (1.68-2.81)	**2.41** (1.79-3.29)	**2.61** (1.85-3.70)
60-min	**0.579** (0.515-0.658)	**0.702** (0.623-0.798)	**0.860** (0.762-0.982)	**0.989** (0.867-1.14)	**1.16** (0.980-1.39)	**1.29** (1.06-1.58)	**1.42** (1.14-1.80)	**1.56** (1.21-2.03)	**1.74** (1.29-2.38)	**1.88** (1.34-2.67)
2-hr	**0.444** (0.395-0.504)	**0.532** (0.472-0.605)	**0.644** (0.570-0.735)	**0.732** (0.642-0.844)	**0.849** (0.717-1.02)	**0.936** (0.771-1.15)	**1.02** (0.819-1.29)	**1.11** (0.860-1.44)	**1.22** (0.905-1.67)	**1.31** (0.931-1.86)
3-hr	**0.380** (0.337-0.431)	**0.455** (0.403-0.517)	**0.549** (0.486-0.626)	**0.623** (0.546-0.717)	**0.719** (0.607-0.861)	**0.790** (0.651-0.969)	**0.860** (0.688-1.08)	**0.929** (0.721-1.21)	**1.02** (0.754-1.39)	**1.09** (0.773-1.54)
6-hr	**0.287** (0.256-0.327)	**0.347** (0.308-0.395)	**0.421** (0.373-0.481)	**0.478** (0.419-0.551)	**0.552** (0.465-0.661)	**0.605** (0.498-0.742)	**0.657** (0.526-0.828)	**0.707** (0.548-0.921)	**0.772** (0.571-1.05)	**0.820** (0.583-1.16)
12-hr	**0.201** (0.178-0.228)	**0.253** (0.225-0.288)	**0.318** (0.281-0.362)	**0.366** (0.321-0.422)	**0.428** (0.361-0.512)	**0.471** (0.388-0.578)	**0.513** (0.411-0.647)	**0.553** (0.429-0.720)	**0.603** (0.446-0.824)	**0.639** (0.455-0.908)
24-hr	**0.138** (0.124-0.157)	**0.183** (0.164-0.208)	**0.237** (0.213-0.271)	**0.279** (0.248-0.320)	**0.330** (0.286-0.389)	**0.367** (0.312-0.440)	**0.402** (0.335-0.492)	**0.436** (0.355-0.546)	**0.478** (0.376-0.620)	**0.508** (0.388-0.679)
2-day	**0.091** (0.082-0.104)	**0.120** (0.108-0.136)	**0.156** (0.140-0.178)	**0.184** (0.164-0.211)	**0.221** (0.191-0.261)	**0.248** (0.211-0.298)	**0.275** (0.229-0.337)	**0.302** (0.246-0.378)	**0.336** (0.264-0.437)	**0.362** (0.277-0.484)
3-day	**0.072** (0.064-0.081)	**0.093** (0.083-0.106)	**0.121** (0.108-0.137)	**0.143** (0.127-0.164)	**0.173** (0.149-0.204)	**0.195** (0.166-0.234)	**0.218** (0.182-0.267)	**0.241** (0.197-0.303)	**0.273** (0.214-0.354)	**0.297** (0.226-0.397)
4-day	**0.060** (0.054-0.068)	**0.078** (0.070-0.088)	**0.101** (0.090-0.115)	**0.119** (0.106-0.137)	**0.145** (0.125-0.171)	**0.164** (0.140-0.197)	**0.184** (0.153-0.225)	**0.204** (0.166-0.256)	**0.232** (0.182-0.301)	**0.254** (0.194-0.339)
7-day	**0.042** (0.038-0.048)	**0.054** (0.049-0.062)	**0.071** (0.063-0.080)	**0.084** (0.074-0.096)	**0.102** (0.088-0.120)	**0.116** (0.098-0.139)	**0.130** (0.108-0.159)	**0.145** (0.118-0.181)	**0.165** (0.129-0.214)	**0.181** (0.138-0.241)
10-day	**0.034** (0.030-0.038)	**0.043** (0.039-0.049)	**0.056** (0.050-0.064)	**0.066** (0.059-0.076)	**0.080** (0.069-0.094)	**0.091** (0.077-0.109)	**0.101** (0.084-0.124)	**0.112** (0.091-0.141)	**0.127** (0.100-0.165)	**0.139** (0.106-0.186)
20-day	**0.022** (0.020-0.025)	**0.029** (0.026-0.033)	**0.037** (0.033-0.042)	**0.043** (0.038-0.049)	**0.051** (0.044-0.060)	**0.057** (0.049-0.069)	**0.063** (0.052-0.077)	**0.069** (0.056-0.086)	**0.076** (0.060-0.099)	**0.082** (0.062-0.109)
30-day	**0.018** (0.016-0.020)	**0.023** (0.021-0.026)	**0.029** (0.026-0.033)	**0.034** (0.030-0.039)	**0.040** (0.035-0.047)	**0.045** (0.038-0.054)	**0.049** (0.040-0.060)	**0.053** (0.043-0.066)	**0.058** (0.045-0.075)	**0.061** (0.047-0.082)
45-day	**0.014** (0.013-0.016)	**0.019** (0.017-0.021)	**0.024** (0.021-0.027)	**0.027** (0.024-0.031)	**0.032** (0.027-0.038)	**0.035** (0.030-0.042)	**0.038** (0.031-0.046)	**0.041** (0.033-0.051)	**0.044** (0.035-0.057)	**0.046** (0.035-0.062)
60-day	**0.013** (0.011-0.015)	**0.016** (0.015-0.019)	**0.021** (0.018-0.024)	**0.024** (0.021-0.027)	**0.027** (0.024-0.032)	**0.030** (0.025-0.036)	**0.032** (0.027-0.040)	**0.035** (0.028-0.043)	**0.037** (0.029-0.048)	**0.039** (0.030-0.052)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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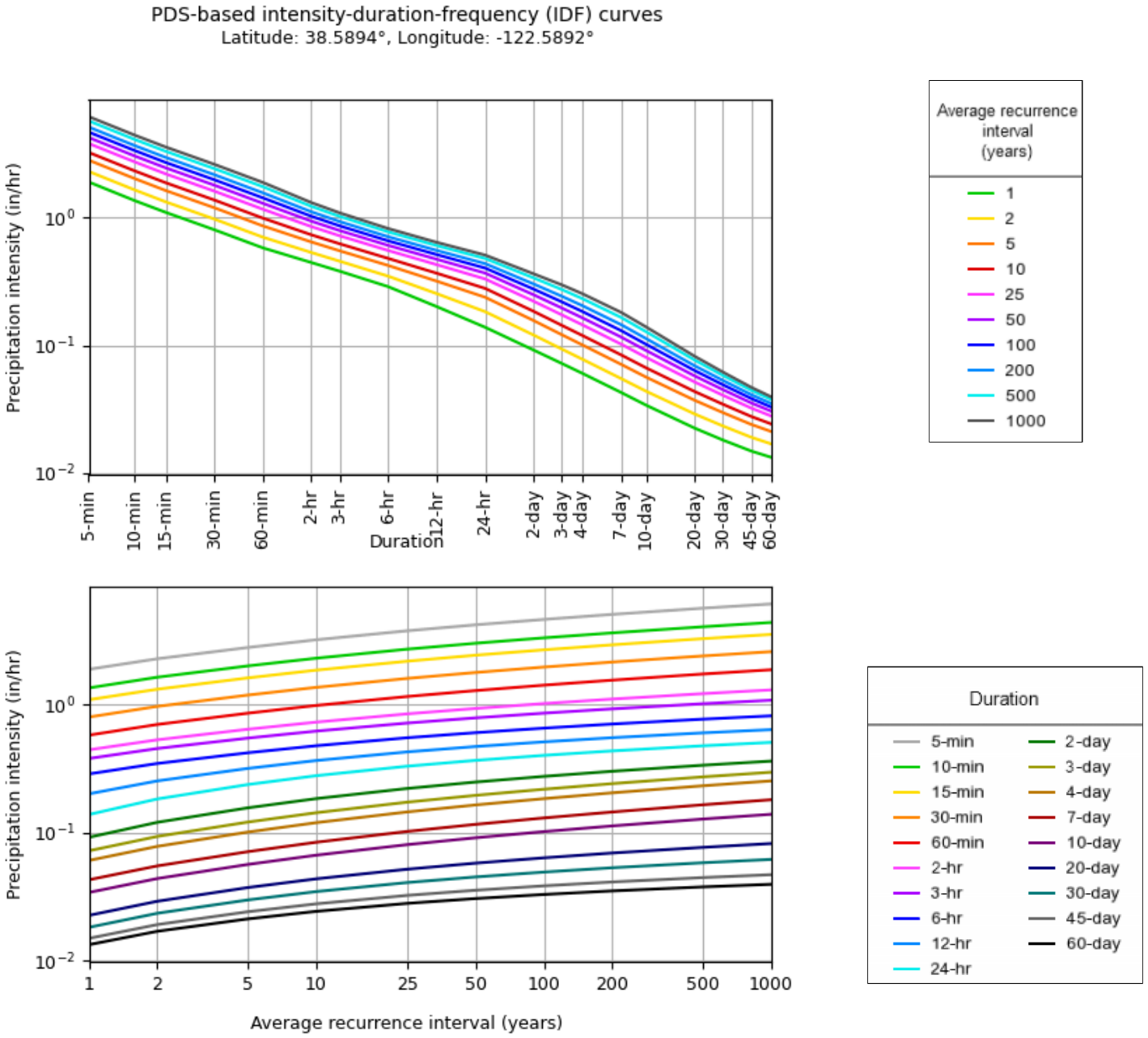
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Apr 22 19:46:21 2025

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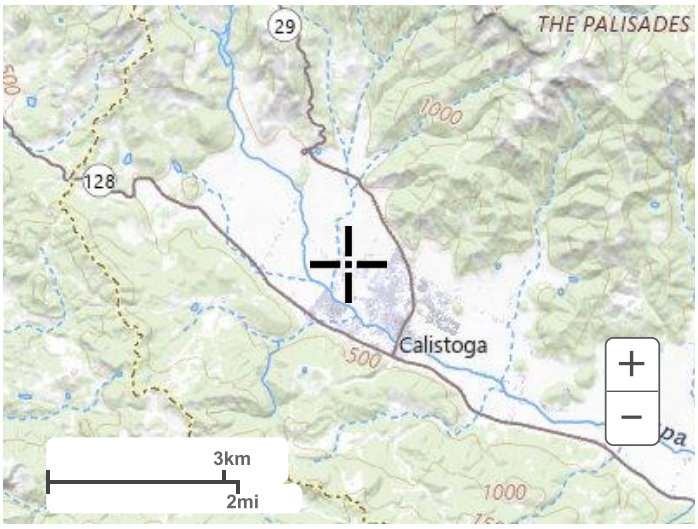
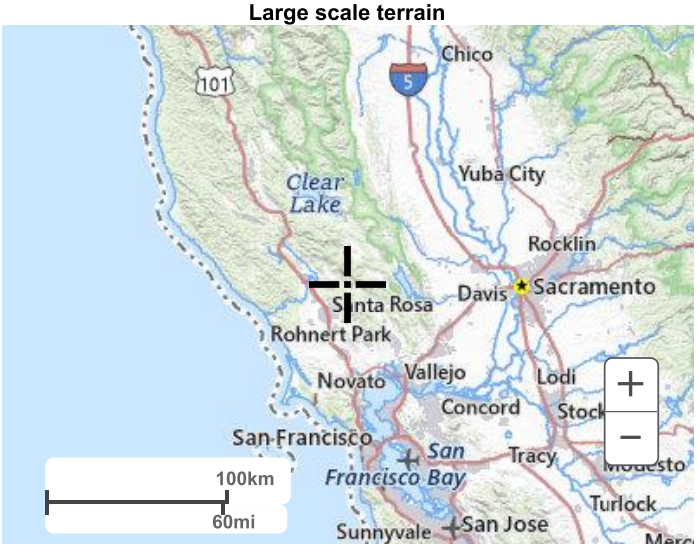
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Exhibit 3
Drainage Conveyance System Capacity Calculations

Hydraulic Analysis Report

Project Data

Project Title: 23270 2400 Grant St.

Designer: DL

Project Date: Wednesday, April 23, 2025

Project Units: U.S. Customary Units

Notes:

Channel Analysis: SD-1

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0030 ft/ft

Manning's n: 0.0120

Depth: 1.4900 ft

Result Parameters

Flow: 6.4491 cfs

Area of Flow: 1.7655 ft^2

Wetted Perimeter: 4.4672 ft

Hydraulic Radius: 0.3952 ft

Average Velocity: 3.6528 ft/s

Top Width: 0.2441 ft

Froude Number: 0.2394

Critical Depth: 0.9822 ft

Critical Velocity: 5.2594 ft/s

Critical Slope: 0.0055 ft/ft

Critical Top Width: 1.43 ft

Calculated Max Shear Stress: 0.2789 lb/ft^2

Calculated Avg Shear Stress: 0.0740 lb/ft^2

Channel Analysis: SD-2

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 9.1300 cfs

Result Parameters

Depth: 1.0315 ft

Area of Flow: 1.6338 ft^2

Wetted Perimeter: 3.2046 ft

Hydraulic Radius: 0.5098 ft

Average Velocity: 5.5884 ft/s

Top Width: 1.9990 ft

Froude Number: 1.0894

Critical Depth: 1.0791 ft

Critical Velocity: 5.2810 ft/s

Critical Slope: 0.0043 ft/ft

Critical Top Width: 1.99 ft

Calculated Max Shear Stress: 0.3218 lb/ft^2

Calculated Avg Shear Stress: 0.1591 lb/ft^2

Channel Analysis: SD-3

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 9.8300 cfs

Result Parameters

Depth: 1.0786 ft

Area of Flow: 1.7278 ft^2

Wetted Perimeter: 3.2989 ft

Hydraulic Radius: 0.5237 ft

Average Velocity: 5.6894 ft/s

Top Width: 1.9938 ft

Froude Number: 1.0771

Critical Depth: 1.1211 ft

Critical Velocity: 5.4238 ft/s

Critical Slope: 0.0044 ft/ft

Critical Top Width: 1.99 ft

Calculated Max Shear Stress: 0.3365 lb/ft^2

Calculated Avg Shear Stress: 0.1634 lb/ft^2

Channel Analysis: SD-4

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 10.5000 cfs

Result Parameters

Depth: 1.1234 ft

Area of Flow: 1.8170 ft^2

Wetted Perimeter: 3.3891 ft

Hydraulic Radius: 0.5361 ft

Average Velocity: 5.7787 ft/s

Top Width: 1.9847 ft

Froude Number: 1.0643

Critical Depth: 1.1602 ft

Critical Velocity: 5.5563 ft/s

Critical Slope: 0.0045 ft/ft

Critical Top Width: 1.97 ft

Calculated Max Shear Stress: 0.3505 lb/ft^2

Calculated Avg Shear Stress: 0.1673 lb/ft^2

Channel Analysis: SD-5

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 10.8100 cfs

Result Parameters

Depth: 1.1441 ft

Area of Flow: 1.8581 ft^2

Wetted Perimeter: 3.4309 ft

Hydraulic Radius: 0.5416 ft

Average Velocity: 5.8179 ft/s

Top Width: 1.9791 ft

Froude Number: 1.0581

Critical Depth: 1.1787 ft

Critical Velocity: 5.6118 ft/s

Critical Slope: 0.0046 ft/ft

Critical Top Width: 1.97 ft

Calculated Max Shear Stress: 0.3570 lb/ft^2

Calculated Avg Shear Stress: 0.1690 lb/ft^2

Channel Analysis: SD-6

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 10.9300 cfs

Result Parameters

Depth: 1.1522 ft

Area of Flow: 1.8739 ft^2

Wetted Perimeter: 3.4471 ft

Hydraulic Radius: 0.5436 ft

Average Velocity: 5.8327 ft/s

Top Width: 1.9767 ft

Froude Number: 1.0557

Critical Depth: 1.1855 ft

Critical Velocity: 5.6347 ft/s

Critical Slope: 0.0046 ft/ft

Critical Top Width: 1.97 ft

Calculated Max Shear Stress: 0.3595 lb/ft^2

Calculated Avg Shear Stress: 0.1696 lb/ft^2

Channel Analysis: SD-7

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 5.2700 cfs

Result Parameters

Depth: 0.8852 ft

Area of Flow: 1.0853 ft^2

Wetted Perimeter: 2.6281 ft

Hydraulic Radius: 0.4130 ft

Average Velocity: 4.8560 ft/s

Top Width: 1.4754 ft

Froude Number: 0.9978

Critical Depth: 0.8840 ft

Critical Velocity: 4.8637 ft/s

Critical Slope: 0.0050 ft/ft

Critical Top Width: 1.48 ft

Calculated Max Shear Stress: 0.2762 lb/ft^2

Calculated Avg Shear Stress: 0.1288 lb/ft^2

Channel Analysis: SD-8

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 16.7400 cfs

Result Parameters

Depth: 1.2131 ft

Area of Flow: 1.9938 ft^2

Wetted Perimeter: 3.5711 ft

Hydraulic Radius: 0.5583 ft

Average Velocity: 8.3962 ft/s

Top Width: 1.9541 ft

Froude Number: 1.4648

Critical Depth: 1.4746 ft

Critical Velocity: 6.7417 ft/s

Critical Slope: 0.0058 ft/ft

Critical Top Width: 1.76 ft

Calculated Max Shear Stress: 0.7570 lb/ft^2

Calculated Avg Shear Stress: 0.3484 lb/ft^2

Channel Analysis: SD-9

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 17.3300 cfs

Result Parameters

Depth: 1.2413 ft

Area of Flow: 2.0488 ft^2

Wetted Perimeter: 3.6291 ft

Hydraulic Radius: 0.5645 ft

Average Velocity: 8.4588 ft/s

Top Width: 1.9409 ft

Froude Number: 1.4509

Critical Depth: 1.5000 ft

Critical Velocity: 6.8568 ft/s

Critical Slope: 0.0060 ft/ft

Critical Top Width: 1.73 ft

Calculated Max Shear Stress: 0.7746 lb/ft^2

Calculated Avg Shear Stress: 0.3523 lb/ft^2

Channel Analysis: SD-10

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 17.5000 cfs

Result Parameters

Depth: 1.2496 ft

Area of Flow: 2.0647 ft^2

Wetted Perimeter: 3.6461 ft

Hydraulic Radius: 0.5663 ft

Average Velocity: 8.4758 ft/s

Top Width: 1.9367 ft

Froude Number: 1.4466

Critical Depth: 1.5078 ft

Critical Velocity: 6.8873 ft/s

Critical Slope: 0.0061 ft/ft

Critical Top Width: 1.72 ft

Calculated Max Shear Stress: 0.7797 lb/ft^2

Calculated Avg Shear Stress: 0.3534 lb/ft^2

Channel Analysis: SD-11

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 17.8300 cfs

Result Parameters

Depth: 1.2655 ft

Area of Flow: 2.0955 ft^2

Wetted Perimeter: 3.6790 ft

Hydraulic Radius: 0.5696 ft

Average Velocity: 8.5089 ft/s

Top Width: 1.9282 ft

Froude Number: 1.4384

Critical Depth: 1.5215 ft

Critical Velocity: 6.9530 ft/s

Critical Slope: 0.0062 ft/ft

Critical Top Width: 1.71 ft

Calculated Max Shear Stress: 0.7897 lb/ft^2

Calculated Avg Shear Stress: 0.3554 lb/ft^2

Channel Analysis: SD-12

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 18.2000 cfs

Result Parameters

Depth: 1.2835 ft

Area of Flow: 2.1301 ft^2

Wetted Perimeter: 3.7164 ft

Hydraulic Radius: 0.5731 ft

Average Velocity: 8.5444 ft/s

Top Width: 1.9180 ft

Froude Number: 1.4288

Critical Depth: 1.5361 ft

Critical Velocity: 7.0292 ft/s

Critical Slope: 0.0063 ft/ft

Critical Top Width: 1.69 ft

Calculated Max Shear Stress: 0.8009 lb/ft^2

Calculated Avg Shear Stress: 0.3576 lb/ft^2

Channel Analysis: SD-13

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0030 ft/ft

Manning's n: 0.0120

Flow: 4.6100 cfs

Result Parameters

Depth: 0.9599 ft

Area of Flow: 1.1943 ft^2

Wetted Perimeter: 2.7818 ft

Hydraulic Radius: 0.4293 ft

Average Velocity: 3.8599 ft/s

Top Width: 1.4400 ft

Froude Number: 0.7469

Critical Depth: 0.8247 ft

Critical Velocity: 4.6311 ft/s

Critical Slope: 0.0048 ft/ft

Critical Top Width: 1.49 ft

Calculated Max Shear Stress: 0.1797 lb/ft^2

Calculated Avg Shear Stress: 0.0804 lb/ft^2

Channel Analysis: SD-14

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0030 ft/ft

Manning's n: 0.0120

Flow: 4.9100 cfs

Result Parameters

Depth: 0.8369 ft

Area of Flow: 1.2461 ft^2

Wetted Perimeter: 2.8140 ft

Hydraulic Radius: 0.4428 ft

Average Velocity: 3.9403 ft/s

Top Width: 1.9732 ft

Froude Number: 0.8738

Critical Depth: 0.7803 ft

Critical Velocity: 4.3264 ft/s

Critical Slope: 0.0039 ft/ft

Critical Top Width: 1.95 ft

Calculated Max Shear Stress: 0.1567 lb/ft^2

Calculated Avg Shear Stress: 0.0829 lb/ft^2

Channel Analysis: SD-15

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 2.0000 ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0120

Flow: 23.3500 cfs

Result Parameters

Depth: 1.2022 ft

Area of Flow: 1.9724 ft^2

Wetted Perimeter: 3.5488 ft

Hydraulic Radius: 0.5558 ft

Average Velocity: 11.8384 ft/s

Top Width: 1.9587 ft

Froude Number: 2.0790

Critical Depth: 1.7168 ft

Critical Velocity: 8.1364 ft/s

Critical Slope: 0.0084 ft/ft

Critical Top Width: 1.39 ft

Calculated Max Shear Stress: 1.5003 lb/ft^2

Calculated Avg Shear Stress: 0.6936 lb/ft^2

Channel Analysis: SWALE-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 0.3100 cfs

Result Parameters

Depth: 0.3889 ft

Area of Flow: 0.3025 ft^2

Wetted Perimeter: 1.7393 ft

Hydraulic Radius: 0.1739 ft

Average Velocity: 1.0247 ft/s

Top Width: 1.5557 ft

Froude Number: 0.4095

Critical Depth: 0.2721 ft

Critical Velocity: 2.0931 ft/s

Critical Slope: 0.0403 ft/ft

Critical Top Width: 1.09 ft

Calculated Max Shear Stress: 0.1456 lb/ft^2

Calculated Avg Shear Stress: 0.0651 lb/ft^2

Channel Analysis: SWALE-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 6.6200 cfs

Result Parameters

Depth: 1.2258 ft

Area of Flow: 3.0052 ft^2

Wetted Perimeter: 5.4820 ft

Hydraulic Radius: 0.5482 ft

Average Velocity: 2.2028 ft/s

Top Width: 4.9032 ft

Froude Number: 0.4959

Critical Depth: 0.9259 ft

Critical Velocity: 3.8610 ft/s

Critical Slope: 0.0268 ft/ft

Critical Top Width: 3.70 ft

Calculated Max Shear Stress: 0.4589 lb/ft^2

Calculated Avg Shear Stress: 0.2052 lb/ft^2

Channel Analysis: SWALE-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 0.3900 cfs

Result Parameters

Depth: 0.4239 ft

Area of Flow: 0.3594 ft^2

Wetted Perimeter: 1.8957 ft

Hydraulic Radius: 0.1896 ft

Average Velocity: 1.0853 ft/s

Top Width: 1.6955 ft

Froude Number: 0.4154

Critical Depth: 0.2983 ft

Critical Velocity: 2.1915 ft/s

Critical Slope: 0.0391 ft/ft

Critical Top Width: 1.19 ft

Calculated Max Shear Stress: 0.1587 lb/ft^2

Calculated Avg Shear Stress: 0.0710 lb/ft^2

Channel Analysis: SWALE-4

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 0.6700 cfs

Result Parameters

Depth: 0.5193 ft

Area of Flow: 0.5392 ft^2

Wetted Perimeter: 2.3222 ft

Hydraulic Radius: 0.2322 ft

Average Velocity: 1.2425 ft/s

Top Width: 2.0770 ft

Froude Number: 0.4297

Critical Depth: 0.3704 ft

Critical Velocity: 2.4420 ft/s

Critical Slope: 0.0364 ft/ft

Critical Top Width: 1.48 ft

Calculated Max Shear Stress: 0.1944 lb/ft^2

Calculated Avg Shear Stress: 0.0869 lb/ft^2

Channel Analysis: SWALE-5

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 1.5400 cfs

Result Parameters

Depth: 0.7094 ft

Area of Flow: 1.0066 ft^2

Wetted Perimeter: 3.1727 ft

Hydraulic Radius: 0.3173 ft

Average Velocity: 1.5299 ft/s

Top Width: 2.8378 ft

Froude Number: 0.4527

Critical Depth: 0.5167 ft

Critical Velocity: 2.8842 ft/s

Critical Slope: 0.0325 ft/ft

Critical Top Width: 2.07 ft

Calculated Max Shear Stress: 0.2656 lb/ft^2

Calculated Avg Shear Stress: 0.1188 lb/ft^2

Channel Analysis: SWALE-6

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 2.3000 cfs

Result Parameters

Depth: 0.8246 ft

Area of Flow: 1.3600 ft^2

Wetted Perimeter: 3.6878 ft

Hydraulic Radius: 0.3688 ft

Average Velocity: 1.6912 ft/s

Top Width: 3.2984 ft

Froude Number: 0.4642

Critical Depth: 0.6066 ft

Critical Velocity: 3.1251 ft/s

Critical Slope: 0.0309 ft/ft

Critical Top Width: 2.43 ft

Calculated Max Shear Stress: 0.3087 lb/ft^2

Calculated Avg Shear Stress: 0.1381 lb/ft^2

Channel Analysis: SWALE-7

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 3.1200 cfs

Result Parameters

Depth: 0.9245 ft

Area of Flow: 1.7094 ft^2

Wetted Perimeter: 4.1345 ft

Hydraulic Radius: 0.4135 ft

Average Velocity: 1.8252 ft/s

Top Width: 3.6980 ft

Froude Number: 0.4731

Critical Depth: 0.6853 ft

Critical Velocity: 3.3217 ft/s

Critical Slope: 0.0296 ft/ft

Critical Top Width: 2.74 ft

Calculated Max Shear Stress: 0.3461 lb/ft^2

Calculated Avg Shear Stress: 0.1548 lb/ft^2

Channel Analysis: SWALE-8

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 1.0300 cfs

Result Parameters

Depth: 0.6101 ft

Area of Flow: 0.7445 ft^2

Wetted Perimeter: 2.7285 ft

Hydraulic Radius: 0.2729 ft

Average Velocity: 1.3835 ft/s

Top Width: 2.4405 ft

Froude Number: 0.4414

Critical Depth: 0.4399 ft

Critical Velocity: 2.6613 ft/s

Critical Slope: 0.0343 ft/ft

Critical Top Width: 1.76 ft

Calculated Max Shear Stress: 0.2284 lb/ft^2

Calculated Avg Shear Stress: 0.1022 lb/ft^2

Channel Analysis: SWALE-9

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 5.2700 cfs

Result Parameters

Depth: 1.1253 ft

Area of Flow: 2.5327 ft^2

Wetted Perimeter: 5.0326 ft

Hydraulic Radius: 0.5033 ft

Average Velocity: 2.0808 ft/s

Top Width: 4.5013 ft

Froude Number: 0.4888

Critical Depth: 0.8452 ft

Critical Velocity: 3.6888 ft/s

Critical Slope: 0.0276 ft/ft

Critical Top Width: 3.38 ft

Calculated Max Shear Stress: 0.4213 lb/ft^2

Calculated Avg Shear Stress: 0.1884 lb/ft^2

Channel Analysis: SWALE-10

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 1.2000 cfs

Result Parameters

Depth: 0.6686 ft

Area of Flow: 0.8939 ft^2

Wetted Perimeter: 2.9899 ft

Hydraulic Radius: 0.2990 ft

Average Velocity: 1.3424 ft/s

Top Width: 2.6742 ft

Froude Number: 0.4092

Critical Depth: 0.4676 ft

Critical Velocity: 2.7439 ft/s

Critical Slope: 0.0336 ft/ft

Critical Top Width: 1.87 ft

Calculated Max Shear Stress: 0.2086 lb/ft^2

Calculated Avg Shear Stress: 0.0933 lb/ft^2

Channel Analysis: SWALE-11

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 2.1200 cfs

Result Parameters

Depth: 0.8276 ft

Area of Flow: 1.3699 ft^2

Wetted Perimeter: 3.7012 ft

Hydraulic Radius: 0.3701 ft

Average Velocity: 1.5476 ft/s

Top Width: 3.3104 ft

Froude Number: 0.4240

Critical Depth: 0.5872 ft

Critical Velocity: 3.0746 ft/s

Critical Slope: 0.0312 ft/ft

Critical Top Width: 2.35 ft

Calculated Max Shear Stress: 0.2582 lb/ft^2

Calculated Avg Shear Stress: 0.1155 lb/ft^2

Channel Analysis: SWALE-12

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 2.7700 cfs

Result Parameters

Depth: 0.9149 ft

Area of Flow: 1.6741 ft^2

Wetted Perimeter: 4.0916 ft

Hydraulic Radius: 0.4092 ft

Average Velocity: 1.6546 ft/s

Top Width: 3.6596 ft

Froude Number: 0.4311

Critical Depth: 0.6535 ft

Critical Velocity: 3.2435 ft/s

Critical Slope: 0.0301 ft/ft

Critical Top Width: 2.61 ft

Calculated Max Shear Stress: 0.2855 lb/ft^2

Calculated Avg Shear Stress: 0.1277 lb/ft^2

Channel Analysis: SWALE-13

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0060 ft/ft

Manning's n: 0.0350

Flow: 1.8300 cfs

Result Parameters

Depth: 0.7569 ft

Area of Flow: 1.1457 ft^2

Wetted Perimeter: 3.3848 ft

Hydraulic Radius: 0.3385 ft

Average Velocity: 1.5973 ft/s

Top Width: 3.0275 ft

Froude Number: 0.4576

Critical Depth: 0.5536 ft

Critical Velocity: 2.9855 ft/s

Critical Slope: 0.0318 ft/ft

Critical Top Width: 2.21 ft

Calculated Max Shear Stress: 0.2834 lb/ft^2

Calculated Avg Shear Stress: 0.1267 lb/ft^2

Exhibit 4
Soil Analysis

Soil Map—Napa County, California
(2400 Grant St.)

Map Scale: 1:4,490 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 17, Sep 8, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2022—Apr 25, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
103	Bale loam, 0 to 2 percent slopes	44.7	100.0%
Totals for Area of Interest		**44.7**	**100.0%**

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Napa County, California

103—Bale loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdk3
Elevation: 20 to 400 feet

Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Alluvial fans
Hydric soil rating: Yes

116—Clear Lake clay, drained, 0 to 2 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2vbt2
Elevation: 10 to 800 feet
Mean annual precipitation: 15 to 31 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 250 to 275 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Clear lake, drained, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clear Lake, Drained

Setting

Landform: Basin floors
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Basin alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap - 0 to 6 inches: clay
Bss1 - 6 to 26 inches: clay
Bss2 - 26 to 36 inches: clay
C - 36 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.5 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 2s

Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Ecological site: R014XG905CA - Clayey Bottom
Hydric soil rating: Yes

Minor Components

Unnamed
Percent of map unit: 5 percent
Landform: Alluvial flats
Hydric soil rating: Yes

Campbell, sicl
Percent of map unit: 3 percent
Hydric soil rating: No

Sunnyvale, sic
Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 17, Sep 8, 2024

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Appendix E.

ASSESSMENT OF THE BUILDING ON 2400 GRANT ST.

Assessment of Building Within the Vineyard Oaks Subdivision Project Area Located in the City of Calistoga, Napa County prepared by Greg Matuzak Environmental Consulting LLC on May 22, 2024

From: Greg Matuzak Environmental Consulting LLC
Greg Matuzak, Principal Biologist
P.O. Box 2016
Nevada City, CA 95959
Phone: (530) 557-5077
Email: gmatuzak@gmail.com

To: Brian Griggs
Griggs Group
Email: brian@griggsgroup.com
Phone: (925) 580-4902

Date: May 22, 2024

Re: **Assessment of Building Within the Vineyard Oaks Subdivision Project Area Located in the City of Calistoga, Napa County**

This Building Assessment Technical Memorandum (Tech Memo) has been developed in response to a comment from the City of Calistoga on the May 8, 2024 Technical Memorandum regarding the 2400 Grant Street Development Project Preliminary CEQA Review for April 2024 Submittal. Included in the City of Calistoga's comments on the Vineyard Oaks Subdivision Project (Project) in the City of Calistoga in Napa County is the following regarding historical resources:

- Historic Resources Memorandum. As the structure proposed for demolition is over 45 years old, a review from a qualified historian is required to document that the project would not have a significant impact on an eligible historic resource. As an alternative to a Historic Resource Evaluation, a memorandum can be provided that includes a review of the structure based on California Register of Historical Resources (CRHR) criteria with a determination of eligibility.

Response to Comment

Based on the previous review of the Project area by the City of Calistoga as part of the CEQA analysis covering the Vineyard Oaks Subdivision Project (dated January 28, 2008), the City of Calistoga concluded the following:

- "no historical resources were recorded within the Vineyard Oaks project area itself, though two historical resources were identified and recorded within a ¼ mile radius" and

- "existing standing structures on the property including the modular home, outbuilding, and water tank appeared to have been constructed relatively recently and were not deemed to comprise historic resources. No impact to historical resources is anticipated since the proposed pipeline outfall will be constructed on the southwest side of the bridge so as to avoid any modification to it."

The updated Project being reviewed by the City of Calistoga now includes the demolition of the outbuilding described above from the 2008 CEQA documentation covering the previous assessment for the Project. The City of Calistoga review (from May 8, 2024) states that the building to be demolished is older than the 45 year old criteria for assessing the structure as a potential historical resource. However, based on the attached Building Permit from the City of Calistoga Building Department, the building to be demolished was permitted to be built in 1984, approximately 40 years ago, which makes it less than the required 45 year threshold. However, the 1984 Building Permit was for the attachment of a new structure to an existing structure that is approximately 10 feet by 20 feet (see attached photos showing the light colored newer structure from 1984 and the older darker structure that was there prior to 1984).

Therefore, this Tech Memo clarifies that the older approximately 200 square foot darker structure is not eligible as a historical resource within the federal or State of California Register of Historical Resources. To be eligible for inclusion in the California Register of Historical Resources, the following criterion must be met:

- Associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States (Criterion 1).

- Associated with the lives of persons important to local, California or national history (Criterion 2).

- Embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values (Criterion 3).

- Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation (Criterion 4).

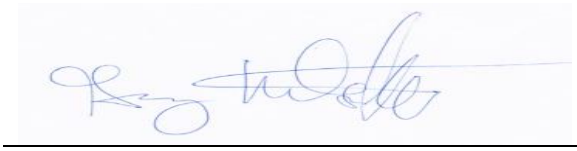
Clearly, the 200 square foot shed does not meet any of the required criterion listed above. The original shed (darker structure in the attached photos) is not associated with any events that have made a significant contribution to the broad patterns of local or regional patterns of cultural heritage. The existing shed is not

associated with lives important to local, California, or national history and therefore, on that criterion alone, the existing shed that is 45+ years old is not eligible for inclusion on the state or federal registry. Lastly, the existing shed has no redeeming qualities that would make it "a work of a master or possesses high artistic values," nor does it yield any important or significant information regarding the history of the local area. Therefore, the shed to be demolished that is 45+ years old would not meet any of the required criterion to be listed under the federal or State of California Register of Historical Resources.

Let me know if you have any questions or comments on this Tech Memo, which should suffice as a qualified response to the comments by the City of Calistoga regarding the removal of the 45+ year old shed within the Project area. Though I am not a historian, I have managed very large projects in Oregon and California that have included properties and structures that were deemed eligible for inclusion within the federal and/or state registries of historical resources. These projects have included old abandoned gold mines from the 1800's in Nevada County, CA and early 1900's rail lines that were vital to the development of western and central Oregon. The old 45+ year old shed would not meet any of the criterion listed above to be deemed eligible for inclusion within the federal and/or state registries of historical resources. Per the findings of the City of Calistoga CEQA review of the property in early 2008, no historical resources were located within the Project area.

I can be reached at the phone number and email listed at the top of this proposal.

Regards,



Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC

BUILDING DEPT. CITY OF CALISTOGA

DATE: Nov. 11, 1984 **PERMIT NO.** 5352

- [X] BUILDING
- [ ] MOBILE HOME
- [X] ELECTRICAL
- [ ] MECHANICAL
- [ ] PLUMBING
- [ ] GRADING
- [ ] ENCROACHMENT

- [ ] NEW
- [X] ADDN
- [ ] ALTER
- [ ] REPAIR
- [ ] DEMO.
- [X] SFD
- [ ] DUPLEX
- [ ] APT.
- [ ] COMM.

OWNER	JOB ADDRESS	HOME ADD.
SMITH	2400 GRANT	SAME

CONTRACTORS	TELEPHONE	STATE LIC. #	PHONE
GENERAL SELF			942-5102
ADDRESS			PARCEL NO. 11-010-13
ELECTRICAL			SUBDIVISION
PLUMBING			
MECHANICAL			LOT NO.
ARCHITECT DESIGNER			

FLOOR AREA	CODE EDITION	GROUP	MAX. OCC.	TYPE
400 ±	1979 UBC	R-3	N/A	V-N
VALUATION $8000	1978 NEC	PROPOSED WORK 20X20' Rm. Add.		BEDROOMS ONE
ZONING RR	USE PERMIT No ☐ CONDITIONS ATTACHED	☐ CONDITIONS ATTACHED		STORIES ONE

MINIMUM OF 24 HOUR NOTICE CALL 942-5188, EXT. 18

TYPE OF INSPECTION	DATE	INSPECTION	TYPE OF INSPECTION	DATE	INSPECTION
FOUNDATION			INSULATION		
UNDERFLOOR/SLAB ELEC.			WALLBOARD		
UNDERFLOOR/SLAB MECH.			MASONRY/FIREPLACE		
UNDERFLOOR/SLAB PLUMB.			GAS SERVICE		
UNDERFLOOR			SEWER SERVICE		
ELECTRIC ROUGH			ELECTRICAL SERVICE		
MECHANICAL ROUGH			GAS APPLIANCE		
PLUMBING ROUGH			ELECTRICAL FINAL		
FRAME ROUGH			PLUMBING FINAL		
LATH OUTSIDE			MECHANICAL FINAL		
			BUILDING FINAL		
			GRADING FINAL		

FEES	AMOUNT
BUILDING PERMIT	$68 50
PLAN CHECK	$51 38
PLUMBING PERMIT	—
ELECTRICAL PERMIT	$20 00
MECHANICAL PERMIT	—
GRADING PERMIT	—
CERTIFICATION PERMIT	—
STRONG MOTION TAX	.56
EXCISE TAX	
SEWER CONN. FEE	
WATER CONN. FEE	
Less Fees Paid	
OWNER/Builder "C"	20 00
Class "C"	12 00
TOTAL	$172 44

READ AND COMPLETE STATEMENT ON THE BACK OF THIS PAGE BEFORE SIGNING

I hereby certify and agree that all Ordinances of the City of Calistoga and the State of California will be complied with whether herein stated or not. Furthermore I hereby authorize representatives of the City of Calistoga to enter upon the above mentioned property for inspection purposes.

X [signature]
APPLICANT'S SIGNATURE

DATE PLAN RECEIVED Nov. 5 19 84 PLAN RECEIVED BY: J. Scales

WORKER'S COMP. CERT. FILED. EXPIR. DATE EXEMPT '9

PERMIT FEE INCLUDES SEISMIC, MICROFILM AND OTHER FEES AUTHORIZED BY CITY ORDINANCE.

BUILDING INSPECTOR X [signature] DATE 11/9/84

OFFICE COPY

CITY OF CALISTOGA

BUILDING PERMIT APPLICATION

A.P.# 11-010-13

DATE NOVEMBER 5, 1984

JOB ADDRESS 2400 Grant Street

OWNER Smith

ADDRESS SAME

PHONE 942-5102

BUILDING	XX	MECHANICAL	
MOBLE HOME		PLUMBING	
ELECTRICAL	XX	OTHER	

WATER SUPPLY — MUNICIPAL ☐ — OTHER XX

SEWER SYSTEM — MUNICIPAL ☐ — OTHER XX

COUNCIL APPROVAL REQUIRED — YES ☐ — NO ☐

GENERAL CONTRACTOR

NAME SELF

ADDRESS

PHONE LIC.#

SUB-CONTRACTOR

ELECTRICAL SELF

PLUMBING NONE

HEATING & COOLING NONE

LAND USE

ZONE RR

OCCUPANCY R-3

BUILDING AREA 400 sq ft 20x20 ft

FLOOD PLAIN NO

VALUATION $ 8,000

USE PERMIT REQD. NO

REMARKS

OFFICE USE ONLY

DATE SUBMITTED 11/5/84

PLANS REQUIRED Yes

CHECKED BY: J. Scotes

APPROVED BY: J. Scotes

BUILDING PERMIT # 5352

SIGNATURE X

BUILDING INSPECTOR

open field ~8 acres
to N property line

RECEIVED
NOV 5 1984

FILE COPY

Patricia Smith
942-5102

Vineyard ~9 acres

APPROVED

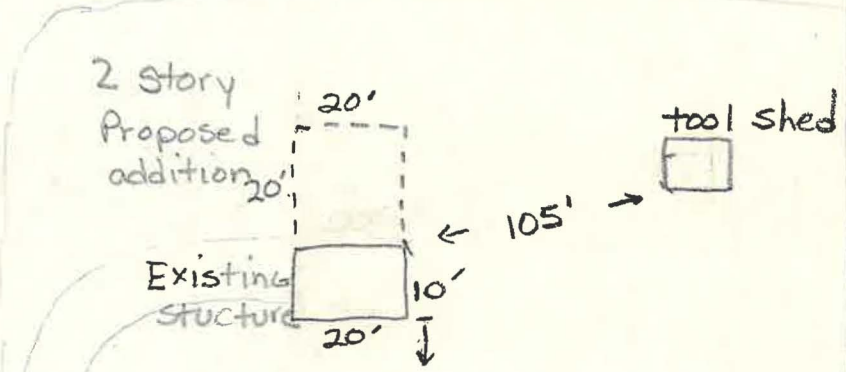
Approval of these plans does not authorize or approve any omission or deviation from requirements of State laws or local ordinance.

One set of approved plans shall be available on the project site at all times.

City of Calistoga, Building Inspection Department
Calistoga, California

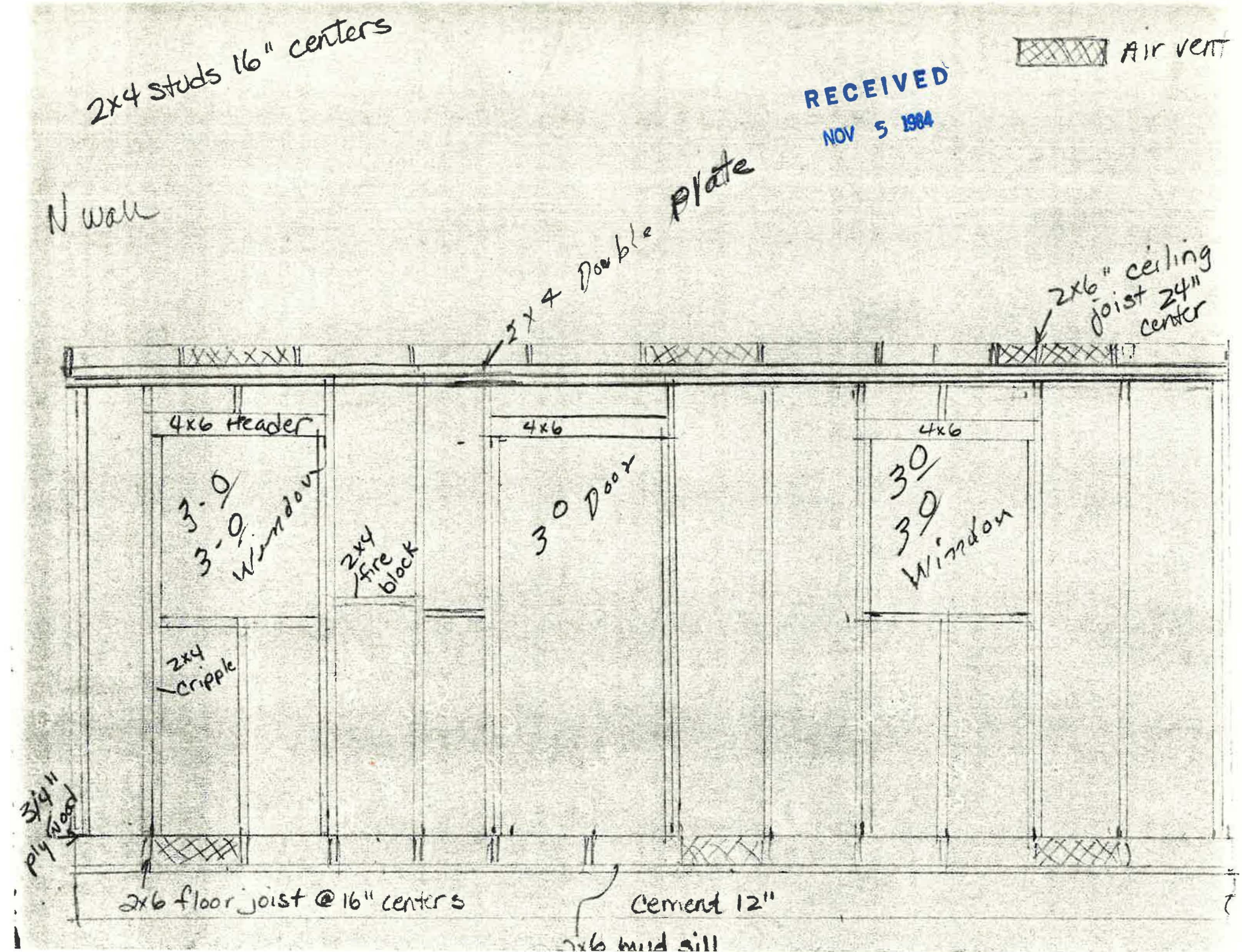
No. 5352

Date 11/6/84 By

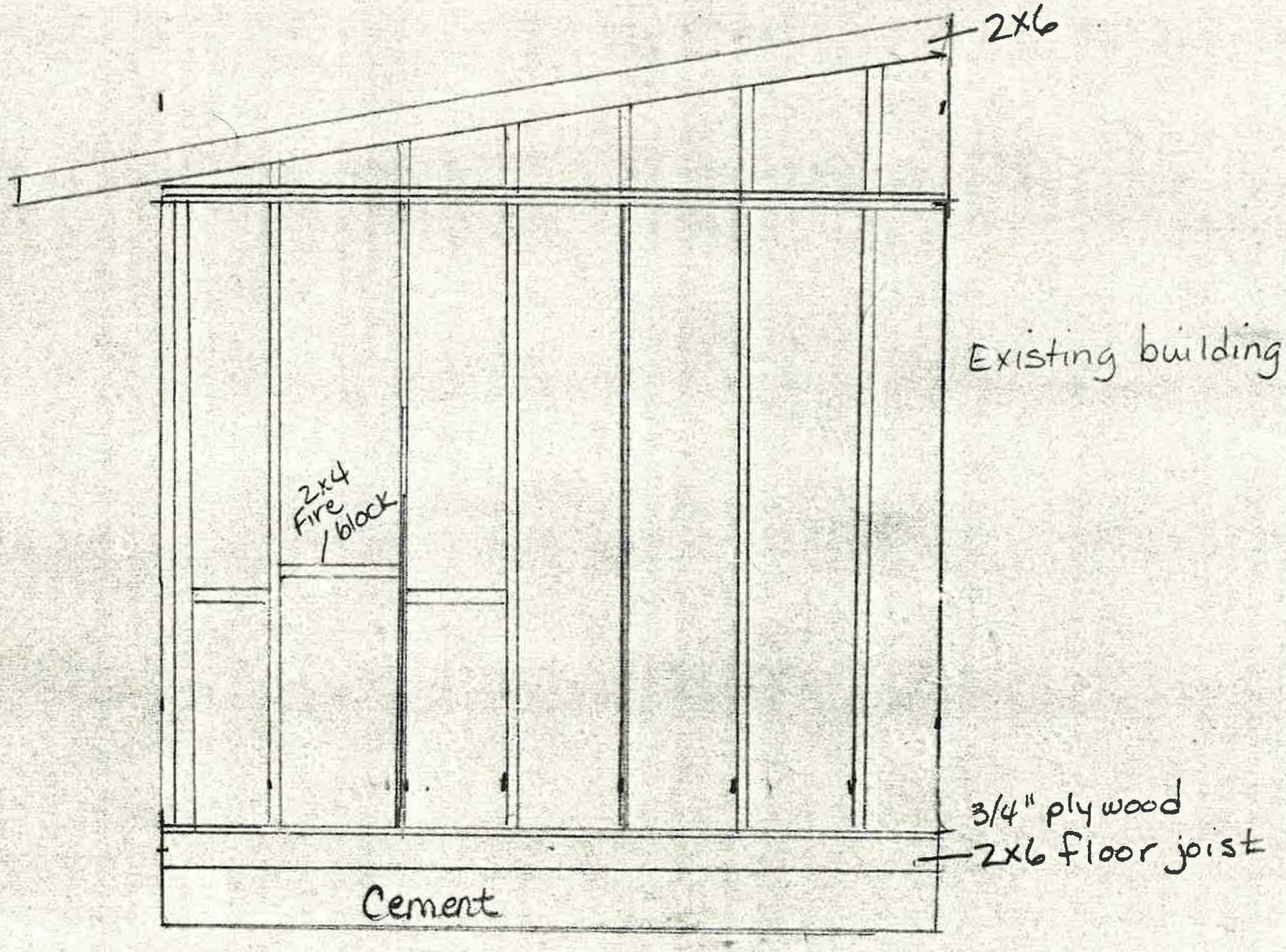


18 acre parcel

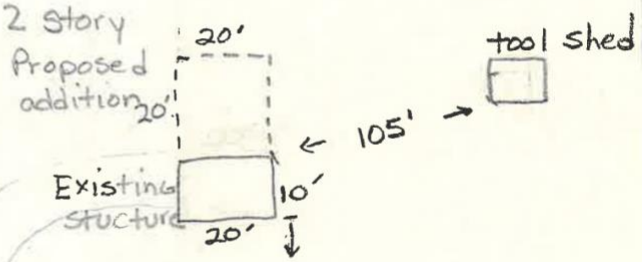
2400 Grant Street


2x4 studs 16" centers
Air vent
RECEIVED
NOV 5 1984
N wall
2x4 Double plate
2x6" ceiling joist 24" center
4x6 Header
3-0
3-0
Window
2x4 fire block
4x6
3 0 Door
4x6
3 0
3 0
Window
2x4 cripple
3/4" plywood
2x6 floor joist @ 16" centers
Cement 12"
2x6 mud sill

1/2" finish sheet rock interior
5/8" exterior plywood siding



Vineyard ~9 acres



APPROVED

Approval of these plans does not authorize or approve any omission or deviation from requirements of State laws or local ordinance.

One set of approved plans shall be available on the project site at all times.

City of Calistoga, Building Inspection Department
Calistoga, California

No. 5352

Date 11/6/84 By

Appendix F.

PRELIMINARY HISTORIC RESOURCE ASSESSMENT

2400 Grant Street, Calistoga Preliminary Historic Resource Evaluation
prepared by M-Group on June 28, 2024.

MEMORANDUM

Date: June 28, 2024

To: City of Calistoga, Planning & Building Department
Olivia Ervin, Principal Environmental Planner
Justin Shiu, Senior Planner

From: Isabel Castellano, Historic Preservation Specialist

Subject: 2400 Grant Street, Calistoga (APN 011-010-057)
Preliminary Historic Resource Evaluation

Introduction

The purpose of this memorandum (memo) is to provide a preliminary historic resource evaluation of the existing structure located on 2400 Grant, Calistoga (APN 011-010-057) to assist the City of Calistoga's California Environmental Quality Act (CEQA) review of the California Farm Home project that includes a Tentative map and Design Review Permit application. The existing structure was built circa 1968, reflects the Minimal Traditional architectural style, is approximately 200 square feet, and faces Grant Street. The property site is located in the Rural Residential (RR) zone and is approximately 17.96 acres.

A brief description of the existing structure, and a preliminary opinion for the eligibility as a historic resource and listing in the state and local register is also included. The conclusion provides recommendations and preliminary findings for the subject properties.

Methodology

The methodological approach used to complete the preliminary evaluation consisted of historical research of the property and the associated persons and events, archived newspaper research (Appendix IV), and subject structure documentation (Appendix III). Further research was conducted using online resources, including archived maps (Appendix II), subject structure photographs (Appendix III), and newspaper articles (Appendix IV). In addition, the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), and the City of Calistoga Municipal Code were reviewed. Additional notes on the architectural style and features of the structures are recorded.

Photographs of the existing structure were provided by the applicant and consultants (Appendix III). A site visit or an archive visit was not conducted for this memo. General obstructions from the photographs typically include landscape, fencing, mechanical and electrical equipment, and parked

vehicles. Additional notes on the architectural features of the structure and neighborhood were recorded for the development of the HRE's site and building descriptions.

City of Calistoga Brief History

The first recorded caretakers of the Calistoga area were the Indigenous members of the Wappo tribe within the Napa Valley region. The area's unique hot springs caught the attention of the first American settlers in the 1840s. Geyser Samuel Brannan visited the area in 1859 and decided to place a hot springs resort in competition with Saratoga Springs in New York. He purchased more than 2,000 acres and used the profit of the sold plots to finance the development of the Calistoga Hot Springs. A railroad was built to connect San Francisco to Napa Valley for the hot springs.

Other significant individuals that are recognized with the City of Calistoga's early development include Robert Louis Stevenson (Scottish writer)and Fanny Vandegriff-Osbourne (American writer) , Giuseppe Musante (Calistoga Sparkling Mineral Water), Elwood Springer (Calistoga Mineral Water beverage water company). The City continues to be associated with the natural hot springs and offer a variety of leisure businesses that include fine dining, local wineries, volcanic mud baths, bicycling, and scenic views.[1]

City of Calistoga's General Plan & Municipal Code

The City of Calistoga's General Plan, adopted in 2003, is the City's fundamental land use and development policy document, which shows how the city will grow and conserve its resources.[2] The purpose of this General Plan is to guide development and conservation in the city through 2020. As described in the General Plan, its "Community Identity Element" is not required by State law. However, due to the importance of Calistoga's unique physical and visual resources, the community has decided to include a Community Identity Element to identify, protect and enhance these features. The Community Identity Element provides information on visual and urban design resources, historic buildings, and archaeological and cultural resources.[3] Community Identity Element, Appendix A also has an inventory of resources that were judged to have potential for listing in the national or state register, based on a preliminary visual survey when the Element was prepared.[4] The subject property was not on the list.

Within the city's Municipal Code, there are no local historic resource, local landmark designation, or historic district designation procedures. However, the City's Municipal code does identify what qualifies as a "historic structure" under section 18.08.185. Refer to the following sections for additional information and evaluation.

[1] City of Calistoga, History. Available at: https://www.ci.calistoga.ca.us/about-us/history
[2] City of Calistoga, General Plan page 2. Available at: https://www.ci.calistoga.ca.us/home/showpublisheddocument/12101/635914052255500000
[3] Ibid, page 5.
[4] Both the Community Identity Element and Appendix A can be found here: https://www.ci.calistoga.ca.us/city-hall/departments-services/planning-building-department/plans-programs-and-land-use-regulations/calistoga-general-plan/calistoga-general-plan

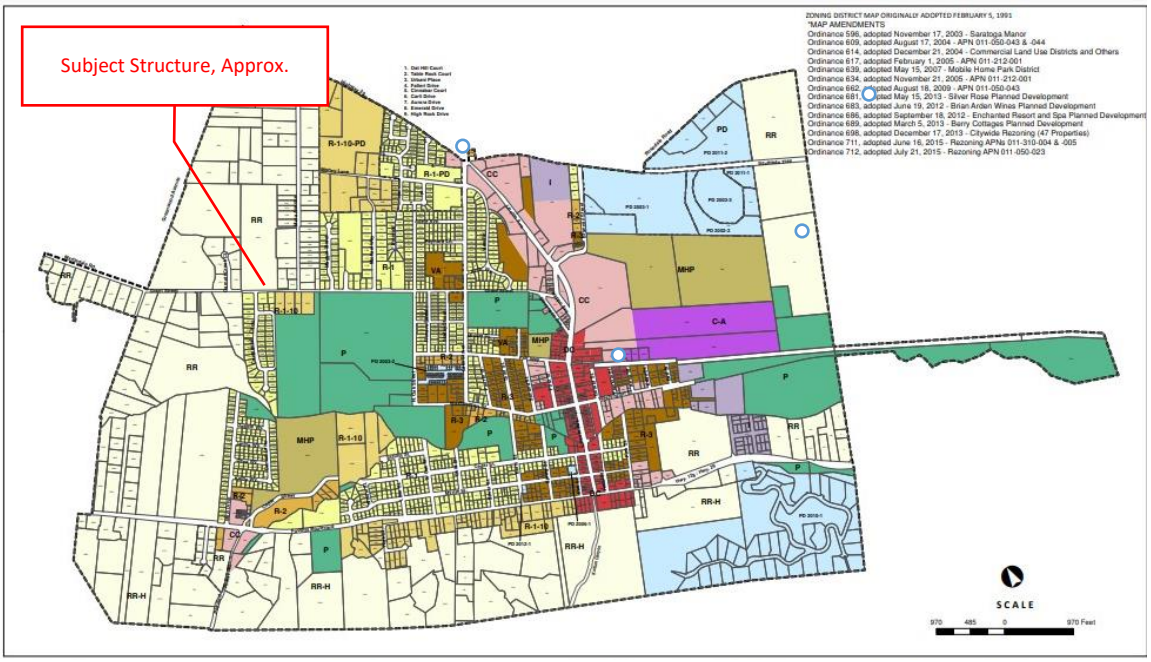


Figure 1: City of Calistoga Zoning Map.
Source: City of Calistoga, Plans, Programs, And Land Use Regulations.

Figure 2: Subject Structure and Property.
Source: Bing Maps, 2024.

Subject Property Brief Description

The subject structure is a single-story and single-family residential structure built circa 1968. This structure is of the Minimal Traditional style, common from 1935, often a small house with gable roofs. This style with a simple floor plan has been used throughout the United States in postwar subdivisions which supported easy automobile access and allowed for quick construction. Typical architectural elements associated with the Minimal Traditional style include gable roofs, low or intermediate pitched roofs, double-hung and multipane windows, slim columns and railings, window shutters, painted siding of horizontal wood panels or stucco surfaces, brick walls and chimneys, and a raised porch that is either recessed or covered.

The subject structure is identified as a Minimal Traditional style, but is not an outstanding example of its respective architectural style within the context of the style as represented in California or the City of Calistoga. It contains a gable roof, covered porch, slim column, painted vertical wood siding, and modern horizontal sliding windows. Building permit records identify a rear addition was completed in 1984. Archived USGS maps recorded a former structure was located in the approximate area of the subject structure and was removed or demolished before 1958. The subject structure was recorded in the USGS by 1993 (Appendix 2).

The Sonoma County Assessor provides a brief overview to the property (Appendix 1). For the location of the subject properties, refer to City of Calistoga Zoning Map (Figure 1), Subject Structure and Property Map (Figure 2), and Subject Structure Documentation (Appendix III). For additional information related to the history of the subject structure and property, refer to "California Historical Resources Information System (CHRIS) Report, File No. 23-1317, dated March 29, 2025, and Building Assessment Technical Memorandum (Tech Memo), by Greg Matuzak, Principal Biologist, Environmental Consulting LLC., dated May 22, 2024.

Figure 3: Subject Structure and Property Site. View from Grant Street.
Source: Google Maps, 2024.

Preliminary Evaluation

Under CEQA resources that meet the criteria of the CRHR are considered historical resources for the purposes of CEQA. *The State Office of Historic Preservation has recommended the National Register of Historic Properties Criteria for Evaluation (used below) as a uniform standard for California because they provide a basis for assessing the significance of historical resources at the national, state, and local levels. As such, they encompass and provide for routine consideration of other applicable state and local criteria.*[5] From these are derived the guidelines used below.

Determinations of historical significance require that several factors are considered, including the property's history (both construction and use); the history and context of the surrounding community; an association with important persons or uses; the number of resources associated with the property; the potential for the resources to be the work of a master architect, builder, craftsman, landscape gardener, or artist; the historical, architectural or landscape influences that have shaped the property's design and its pattern of use; and alterations that have taken place; and lastly how these changes may have affected the property's historical integrity.

These issues must be explored thoroughly before a final determination of significance can be established. To be eligible for the California Register, historic resources must possess both historical significance and retain historic integrity. The following are the four significance criteria of the California Register. Upon review of the criteria, if historic significance is identified, then an integrity analysis can be conducted. To be eligible for the California Register, an historical resource must be significant at the local, state, or national level under at least one of the following criteria noted below.

This preliminary evaluation memo provides a brief analysis of the subject properties with the CRHR Criterion and City of Calistoga's Municipal Code for planning review.

CRHR Criteria

Criterion 1: Event or Patterns of Events

It is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.

Brief historical research has determined that the subject structure does not qualify under Criterion 1: Event or Patterns of Events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States. The subject structure's Minimal Traditional architectural style is illustrative of the architectural types and patterns of development of many of the region's residential neighborhoods. However, does not rise to a level of significance to justify individual California Register or local eligibility as an individual property. As a result, the dwelling does not qualify individually under California Register Criterion 1: Event or Pattern of Events.

[5] Instructions for Recording Historical Resources, Office of Historic Preservation, March 1995.

Criterion 2: Important Person(s)

It is associated with the lives of persons important to local, California or national history.

Brief historical research has determined that subject properties, are not associated with any individuals who have had an important role in local, California or national history. The National Register Bulletin "How to Apply the National Register Criteria for Evaluation," provides guidance in applying the criterion for "Important Persons":

The persons associated with the property must have gained importance within his or her profession or group. … A property is not *eligible if its only justification for significance is that it was owned or used by a person who is a member of an identifiable profession, class, or social or ethnic group. It must be shown that the person gained importance within his or her profession or group.*

Brief research on the property's address within archived local newspaper articles (Appendix IV) did not demonstrate significant nor historic backgrounds to qualify the subject structure as significantly historic. The articles related to the sale of land nearby Grant Street. As a result, the subject property does not qualify individually under California Register Criterion 2: Important Person(s).

Criterion 3: Design/Construction

It embodies the distinctive characteristics of a type, period, region or method of construction, or represents the work of a master, or possesses high artistic values.

Brief research has not identified a significant architect or designer with the subject property. The review of the subject properties' architectural style and architectural features has provided a description of the building's current state in relation to its design and construction. As previously noted, the subject structure reflects a Minimal Traditional architectural style, but is not an outstanding example of its respective architectural style within the context of the style as represented in California or the City of Calistoga. The subject structure contains a variation of architectural elements involved in the identification of its architectural style and includes modern architectural features such as horizontal sliding windows. The subject structure does not possess unique or significant architectural features. As a result, the subject property does not qualify individually under California Register Criterion 3: Design/Construction.

Criterion 4: Information Potential

It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

Information related to the prehistory or history of the local area, California or the nation, is not included in this preliminary evaluation of the subject structure. Refer to "California Historical Resources Information System (CHRIS) Report, File No. 23-1317, dated March 29, 2025, for additional site history and information.

City of Calistoga Municipal Code

As previously mentioned, within the city's Municipal Code, there are no local historic resource, local landmark designation, or historic district designation procedures. However, the City's Municipal code does define a "historic structure" as any structure that is the following:

Municipal Code Section 18.08.185 - Historic structure

A. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

B. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

C. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

D. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states without approved programs. (Ord. 564 § 2, 2000).

The subject structure is not identified as a historic resource as defined by the City of Calistoga's Municipal code, as it is (A) not a structure listed in the National of Historic Places, (B) not a certified or preliminary determined by the Secretary of the Interior a contributor to a registered or preliminary determined historic district, (C) not individually listed in a state inventory of historic places, and (D) not individually listed in a local inventory of historic places.

Conclusion

The preliminary evaluation has found, including the recommendation noted in the previous section, that the subject structure, located at 2400 Grant Street, Calistoga, does not possess historical significance, are not a strong example of the Minimal Traditional architectural style, was not designed by a master architect or builder, and are not associated with important events or persons. It is the professional opinion of M-Group that the structure (1) is not individually eligible for the California Register of Historical Resources, (2) does not qualify individually as a historical resource under CEQA Guidelines §15064.5(a)(3), and (3) does not meet the City of Calistoga's Municipal Code definition for a "historic structure."

Appendix I – Subject Property Tax Assessor Report

PRINT

Napa County
California

Property Information

Assessor Parcel Number(APN)	011-010-057-000
Assessment Number	011-010-057-000
Tax Rate Area(TRA)	001000
Current Document Number	2014R0014679
Current Document Date	7/18/2014
SitusAddr	2400 GRANT ST CALISTOGA
Property Type	VACANT LOT W/MISC IMP
Lot Size(Acres)	17.96
Lot Size(SqFt)	0.00
Asmt Description	
Asmt Status	ACTIVE

Roll Values

Land	$4,406,695
Structural Imprv	$11,778
Fixtures Real Property	$0
Growing Imprv.	$0
Total land & Improvemnets	$4,418,473
Fixtures Personal Property	$0
Personal Property	$0
Manufactured Homes	$0
Homeowners Exemption(HOX)	$0
Other Exemptions	$0
Net Assessed Value	$4,418,473

Building Description

Building Seq. Number	1
Unit Seq. Number	0
Building Code	1

Current Doc Num	2014R0014679
Building Square Footage	440.00
Number of units	1
Building Type	
Garage Size	0.00
UnFinished Square Footage	0.00
Year Built	1968
Bedrooms	1
Full Baths	0
Half Baths	0
FirePlaces	
Pools	

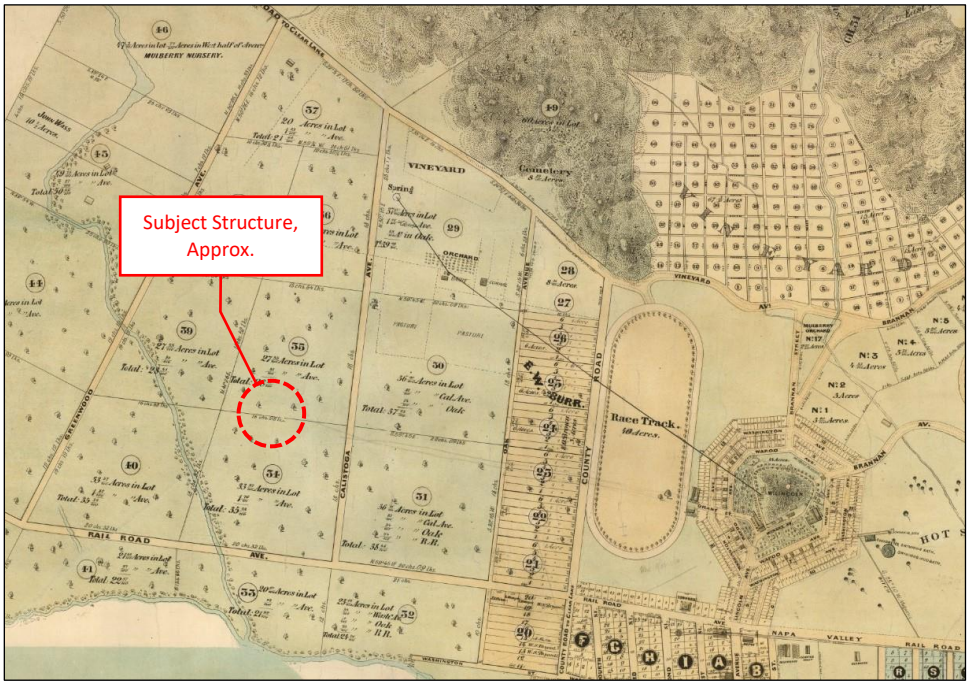
John Tuteur
Assessor

1127 First Street Suite A Napa,CA,94559

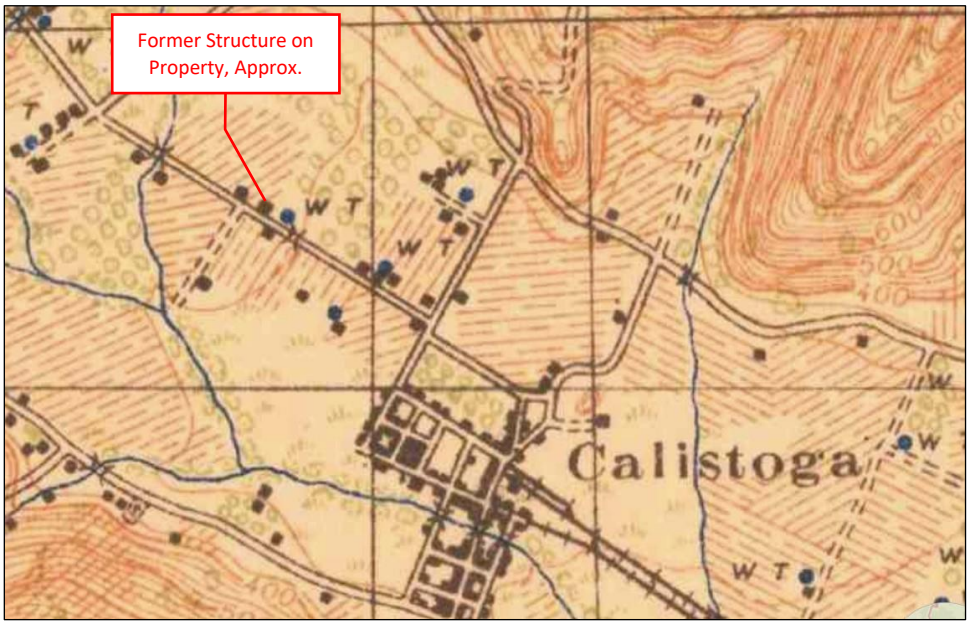
707-253-4466

assessor@countyofnapa.org

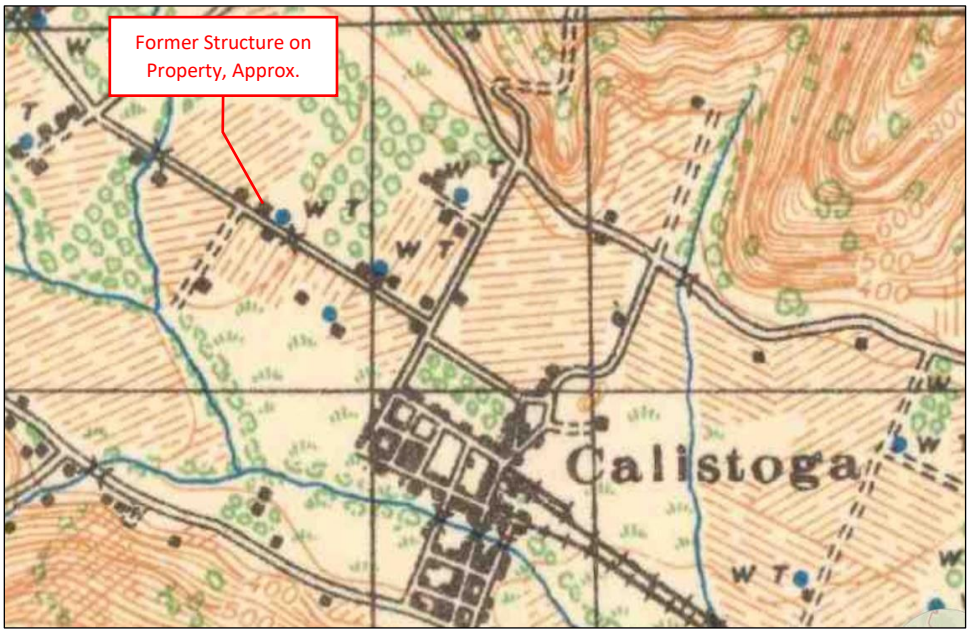
Appendix II – Maps



City of Calistoga Survey, 1871.



USGS Map, 1927.



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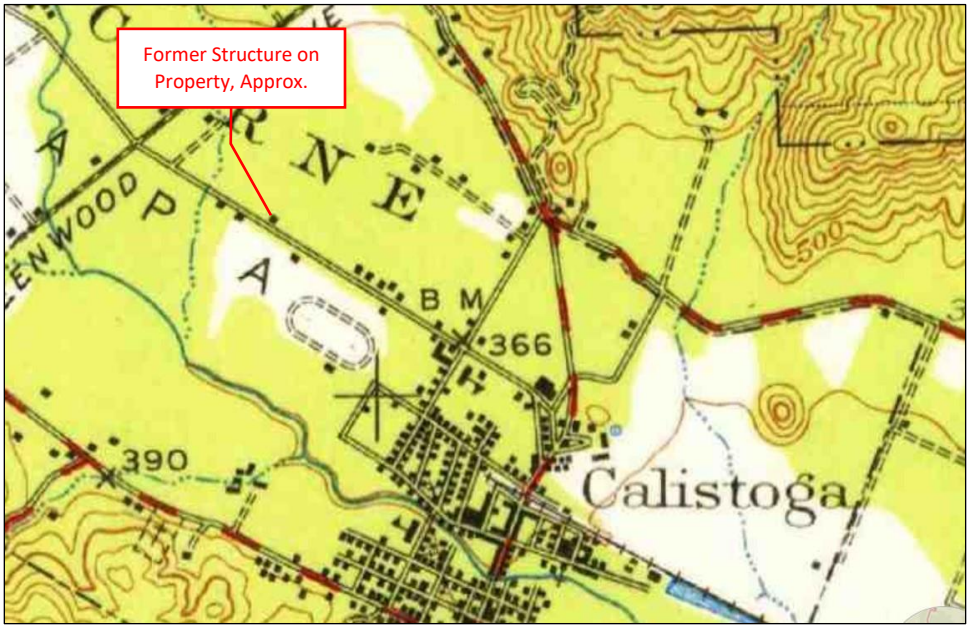
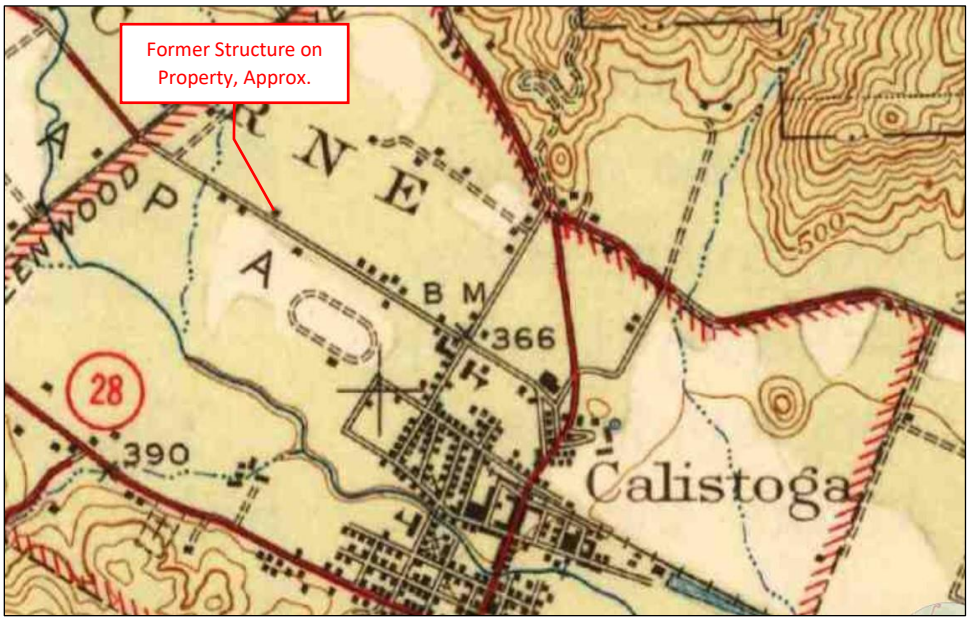
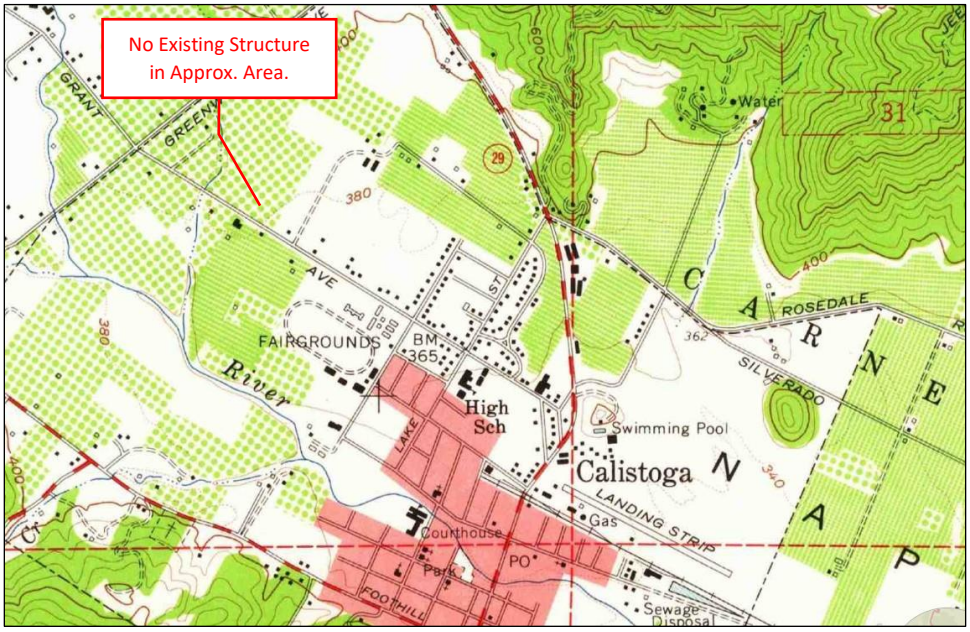


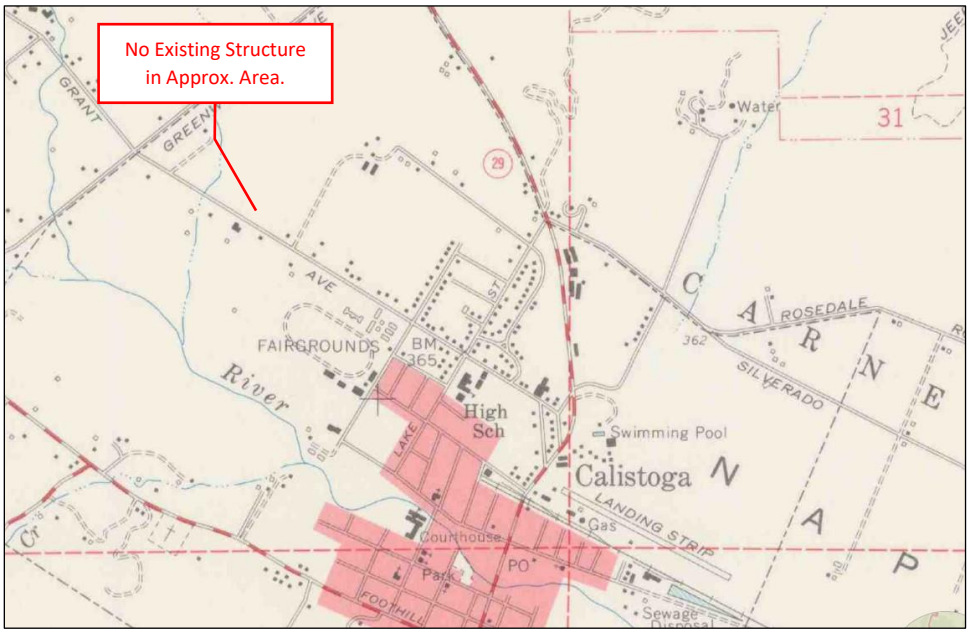
USGS Map, 1943.



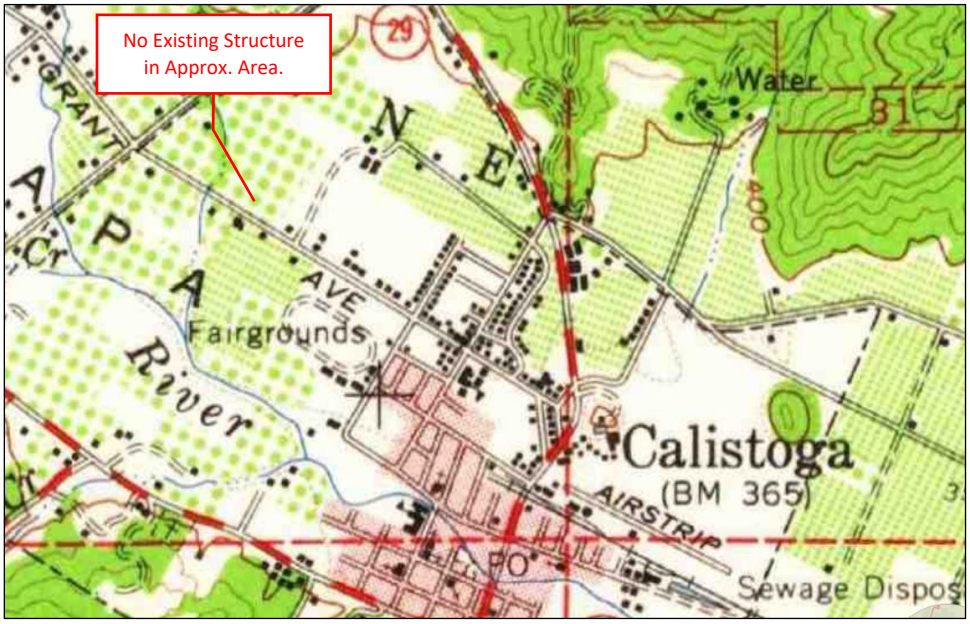
USGS Map, 1945.



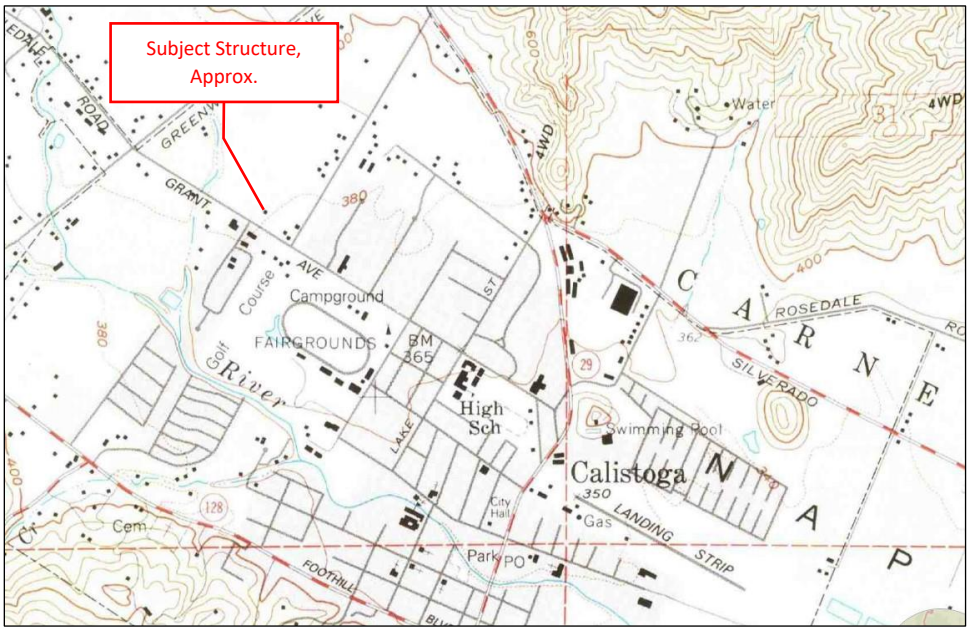
USGS Map, 1958.



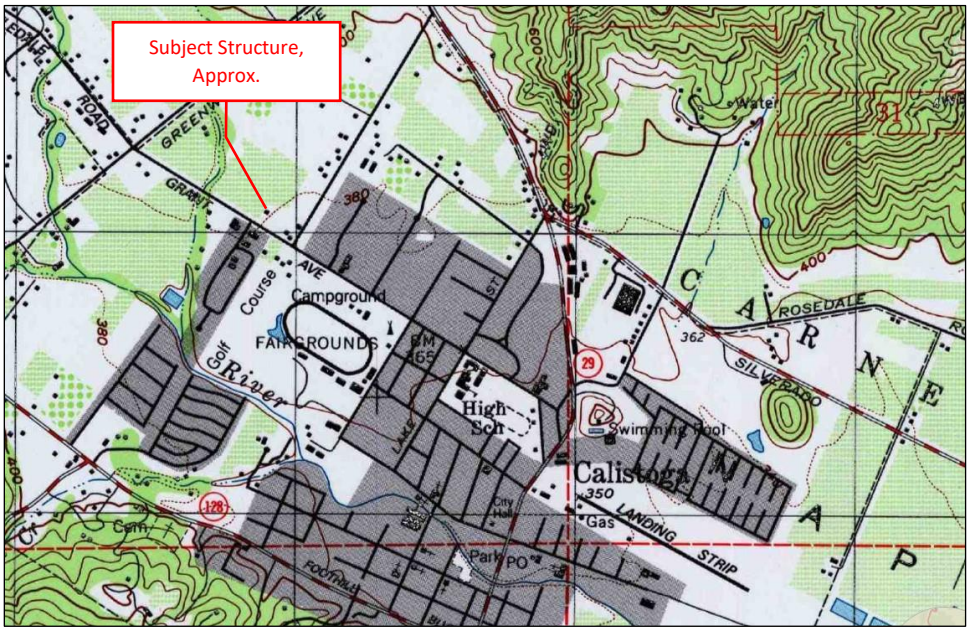
USGS Map, 1958.



USGS Map, 1959.



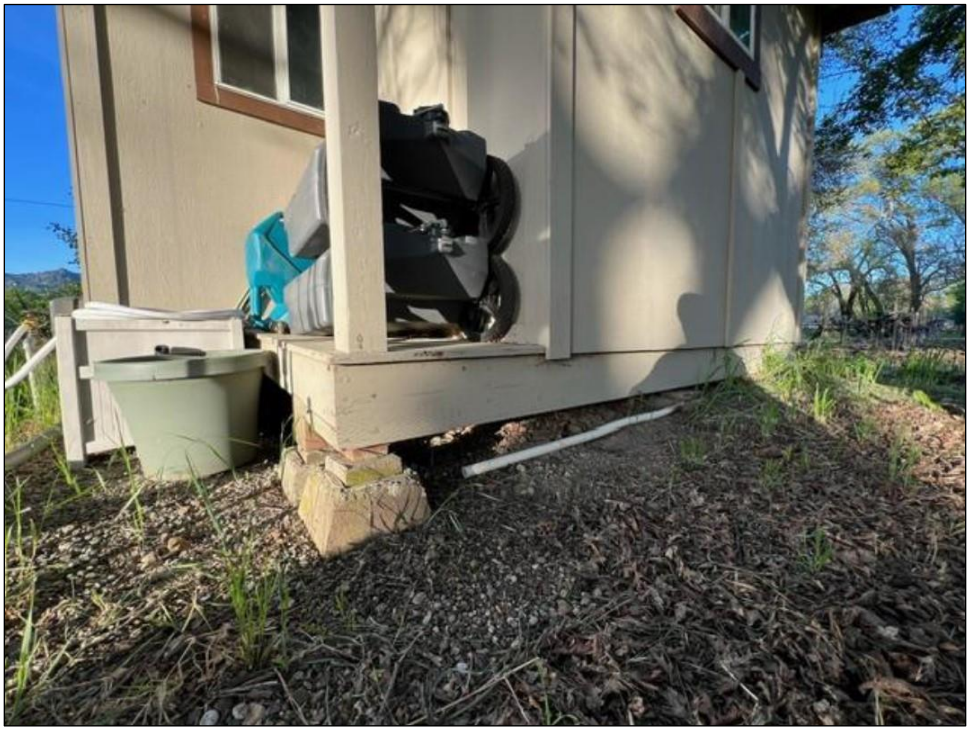
USGS Map, 1993.



USGS Map, 1997.

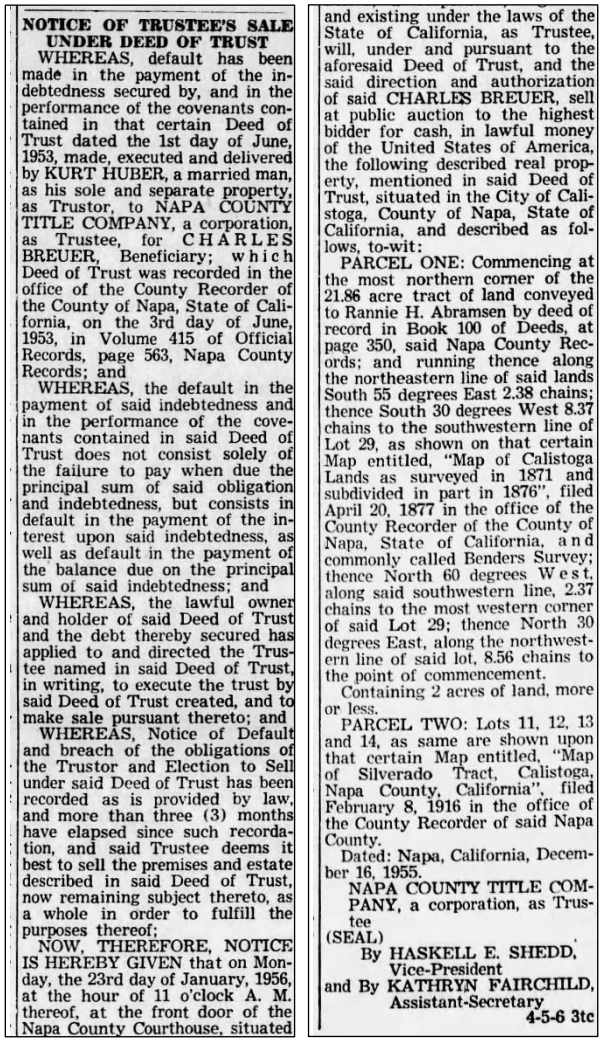
Appendix III – Subject Structure Documentation

Photographs provided by the applicant.



Appendix IV – Newspaper Articles

Source: Newspaper.com



NOTICE OF TRUSTEE'S SALE UNDER DEED OF TRUST

WHEREAS, default has been made in the payment of the indebtedness secured by, and in the performance of the covenants contained in that certain Deed of Trust dated the 1st day of June, 1953, made, executed and delivered by KURT HUBER, a married man, as his sole and separate property, as Trustor, to NAPA COUNTY TITLE COMPANY, a corporation, as Trustee, for CHARLES BREUER, Beneficiary; which Deed of Trust was recorded in the office of the County Recorder of the County of Napa, State of California, on the 3rd day of June, 1953, in Volume 415 of Official Records, page 563, Napa County Records; and

WHEREAS, the default in the payment of said indebtedness and in the performance of the covenants contained in said Deed of Trust does not consist solely of the failure to pay when due the principal sum of said obligation and indebtedness, but consists in default in the payment of the interest upon said indebtedness, as well as default in the payment of the balance due on the principal sum of said indebtedness; and

WHEREAS, the lawful owner and holder of said Deed of Trust and the debt thereby secured has applied to and directed the Trustee named in said Deed of Trust, in writing, to execute the trust by said Deed of Trust created, and to make sale pursuant thereto; and

WHEREAS, Notice of Default and breach of the obligations of the Trustor and Election to Sell under said Deed of Trust has been recorded as is provided by law, and more than three (3) months have elapsed since such recordation, and said Trustee deems it best to sell the premises and estate described in said Deed of Trust, now remaining subject thereto, as a whole in order to fulfill the purposes thereof;

NOW, THEREFORE, NOTICE IS HEREBY GIVEN that on Monday, the 23rd day of January, 1956, at the hour of 11 o'clock A. M. thereof, at the front door of the Napa County Courthouse, situated and existing under the laws of the State of California, as Trustee, will, under and pursuant to the aforesaid Deed of Trust, and the said direction and authorization of said CHARLES BREUER, sell at public auction to the highest bidder for cash, in lawful money of the United States of America, the following described real property, mentioned in said Deed of Trust, situated in the City of Calistoga, County of Napa, State of California, and described as follows, to-wit:

PARCEL ONE: Commencing at the most northern corner of the 21.86 acre tract of land conveyed to Rannie H. Abramsen by deed of record in Book 100 of Deeds, at page 350, said Napa County Records; and running thence along the northeastern line of said lands South 55 degrees East 2.38 chains; thence South 30 degrees West 8.37 chains to the southwestern line of Lot 29, as shown on that certain Map entitled, "Map of Calistoga Lands as surveyed in 1871 and subdivided in part in 1876", filed April 20, 1877 in the office of the County Recorder of the County of Napa, State of California, and commonly called Benders Survey; thence North 60 degrees West, along said southwestern line, 2.37 chains to the most western corner of said Lot 29; thence North 30 degrees East, along the northwestern line of said lot, 8.56 chains to the point of commencement.

Containing 2 acres of land, more or less.

PARCEL TWO: Lots 11, 12, 13 and 14, as same are shown upon that certain Map entitled, "Map of Silverado Tract, Calistoga, Napa County, California", filed February 8, 1916 in the office of the County Recorder of said Napa County.

Dated: Napa, California, December 16, 1955.

NAPA COUNTY TITLE COMPANY, a corporation, as Trustee

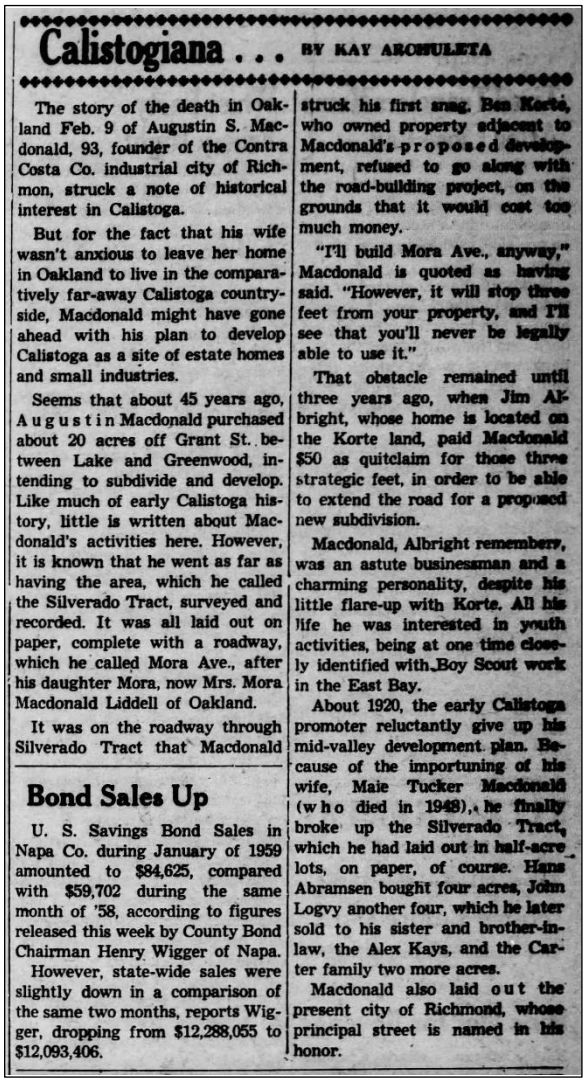
(SEAL)

By HASKELL E. SHEDD, Vice-President

and By KATHRYN FAIRCHILD, Assistant-Secretary

4-5-6 3tc

January 5, 1956



Calistogiana . . . BY KAY ARCHULETA

The story of the death in Oakland Feb. 9 of Augustin S. Macdonald, 93, founder of the Contra Costa Co. industrial city of Richmon, struck a note of historical interest in Calistoga.

But for the fact that his wife wasn't anxious to leave her home in Oakland to live in the comparatively far-away Calistoga countryside, Macdonald might have gone ahead with his plan to develop Calistoga as a site of estate homes and small industries.

Seems that about 45 years ago, Augustin Macdonald purchased about 20 acres off Grant St. between Lake and Greenwood, intending to subdivide and develop. Like much of early Calistoga history, little is written about Macdonald's activities here. However, it is known that he went as far as having the area, which he called the Silverado Tract, surveyed and recorded. It was all laid out on paper, complete with a roadway, which he called Mora Ave., after his daughter Mora, now Mrs. Mora Macdonald Liddell of Oakland.

It was on the roadway through Silverado Tract that Macdonald struck his first snag. Ben Korte, who owned property adjacent to Macdonald's proposed development, refused to go along with the road-building project, on the grounds that it would cost too much money.

"I'll build Mora Ave., anyway," Macdonald is quoted as having said. "However, it will stop three feet from your property, and I'll see that you'll never be legally able to use it."

That obstacle remained until three years ago, when Jim Albright, whose home is located on the Korte land, paid Macdonald $50 as quitclaim for those three strategic feet, in order to be able to extend the road for a proposed new subdivision.

Macdonald, Albright remembers, was an astute businessman and a charming personality, despite his little flare-up with Korte. All his life he was interested in youth activities, being at one time closely identified with Boy Scout work in the East Bay.

About 1920, the early Calistoga promoter reluctantly give up his mid-valley development plan. Because of the importuning of his wife, Maie Tucker Macdonald (who died in 1948), he finally broke up the Silverado Tract, which he had laid out in half-acre lots, on paper, of course. Hans Abramsen bought four acres, John Logvy another four, which he later sold to his sister and brother-in-law, the Alex Kays, and the Carter family two more acres.

Macdonald also laid out the present city of Richmond, whose principal street is named in his honor.

Bond Sales Up

U. S. Savings Bond Sales in Napa Co. during January of 1959 amounted to $84,625, compared with $59,702 during the same month of '58, according to figures released this week by County Bond Chairman Henry Wigger of Napa.

However, state-wide sales were slightly down in a comparison of the same two months, reports Wigger, dropping from $12,288,055 to $12,093,406.

February 19, 1959

Appendix G.

TRANSPORTATION IMPACT STUDY

Final Transportation Impact Study for the 2400 Grant Street Project prepared by W-Trans on May 21, 2025.

May 21, 2025

Mr. Brian Griggs
Griggs Resource Group
935 Moraga Road, Suite 200
Lafayette, CA 94549

Final Transportation Impact Study for the 2400 Grant Street Project

Dear Mr. Griggs;

W-Trans has completed an evaluation of the potential transportation impacts associated with the proposed residential project to be located at 2400 Grant Street. The scope for the traffic study was reviewed by City staff and this letter report presents the results of our findings and includes the additional analysis requested by staff.

Project Description

The proposed project is a 17-lot residential subdivision to be located at 2400 Grant Street in the City of Calistoga. Access would occur via a connection to Grant Street that would form the north leg of the existing intersection at Centennial Circle. A secondary Emergency Vehicle Access (EVA) would connect to Mora Avenue.

Setting

The study area consisted of the section of Grant Street fronting the project site and within a half mile east and west of the project site, the project access points, as well as the intersection of Grant Street/Mora Avenue. Grant Street along the project frontage is an east-west street with one lane in each direction and a posted speed limit of 25 miles per hour (mph). Mora Avenue is a north-south street with a posted speed limit of 25 mph and one lane in each direction. The intersection of Grant Street/Mora Avenue is stop-controlled on the terminating Mora Avenue approach. Conditions during the weekday a.m. and p.m. peak periods were evaluated.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 11th Edition, 2021, for Single Family Detached Housing (LU #210). Based on the application of these rates, the proposed project is expected to generate an average of 160 trips per day, including 12 a.m. peak hour trips and 16 trips during the p.m. peak hour. These results are summarized in Table 1.

Table 1 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Single Family Detached	17 du	9.43	160	0.70	12	3	9	0.94	16	10	6

Note: du = dwelling unit

Trip Distribution

The pattern used to allocate new project trips to the street network was determined based on knowledge of the study area. It was assumed that 75 percent of trips would be to/from the southeast and 25 percent to/from the northwest.

CEQA Analysis

Active Mode Facilities

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a connected pedestrian network is lacking in the project vicinity and there are no sidewalks along the project frontage on Grant Street. The only sidewalks in the immediate vicinity of the project site are located on the north side of Grant Street 140 feet both east and west of the intersection with Garnett Creek Court, 140 feet west and 80 feet east of Maggie Avenue on the north side of the street, on the south side 160 feet west of Centennial Court, and along the entire lengths of Centennial Court, Garnett Creek Court, and Maggie Avenue. The City of Calistoga's *Active Transportation Plan*, 2014 (ATP) includes plans for sidewalks along the north side of Grant Street from Mora Avenue to Lake Street and a pedestrian path on the south side of Grant Street from Mora Avenue to the western City limits.

The project as proposed would provide a bike and pedestrian path along the south side of Grant Street between Centennial Court and Mora Street, as shown on the site plans dated May 21, 2025.

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue for pedestrians. Collision records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports were reviewed for the most current five-year period available, which was January 1, 2018, through December 31, 2022, at the time of the analysis. During the five-year study period there were no reported collisions involving pedestrians on the study segment.

Bicycle Facilities

In the project area, Class III bike routes exist along the length of Centennial Court and Grant Street between the western City limits and Mora Avenue, and a Class II bike lane exists on the south side of Grant Street between Mora Avenue and N. Oak Street. A Class III bike route is planned for Mora Avenue. As noted above, the project would provide a bike and pedestrian path on the south side of Grant Avenue. The project would not affect any existing facilities or preclude any planned facilities.

Collision records for the study area were reviewed to determine if there had been any bicyclist-involved crashes that may indicate a safety issue for bicyclists. During the five-year study period between January 1, 2018, and December 31, 2022, there were no reported collisions involving cyclists on the study segment.

Transit Facilities

VINE Transit provides regional fixed route bus service in Napa County and Lake Transit provides regional service in Lake County with stops in Calistoga; however, neither service has stops within an acceptable walking distance (one-quarter mile) of the project site.

Dial-a-ride, also known as paratransit, or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. VineGo Paratransit is designed to serve the needs of individuals with disabilities within Calistoga and the greater Napa-Solano area.

Vehicle Facilities

The project as proposed would result in the construction of a private street with two 12-foot travel lanes to provide access to the new homes. The proposed street does not match any of the street types shown in the City of Santa Rosa's *Street Design and Construction Standards,* 2004, which are the standards adopted by the City of Calistoga. The closest type is the "Rural/Hillside Street" which has two 12-foot travel lanes and no parking or sidewalks. The

street as proposed would have two 12-foot travel lanes and a sidewalk on one side. One of the criterion for use of this street type is that it is to be used "in cases where a standard street section would require excessive grading and/or tree and natural features removal." It is understood that this street type was chosen to avoid loss of trees on the project site.

Section 16.16.030 of the City of Calistoga's *Municipal Code* requires that a proposed street be dedicated as a public street unless the Planning Commission or Council approves its use as a private street. This approval must be justified based on topography or other natural features and the subdivider must provide a reasonable method for maintenance that has been approved by both the Director of Public Works and the City Attorney. It is understood that the approval of the project by the Planning Commission would address this requirement.

Finding – While there are currently limited facilities for pedestrian, bicycle, and transit access, the project as proposed would improve upon existing pedestrian facilities by providing a two-way pedestrian pathway on the project site. As the street is proposed as a private street, it would need to be approved as such by the Planning Commission and/or City Council.

VMT

Senate Bill (SB) 743 established the change in Vehicle Miles Traveled (VMT) as a result of a project as the basis for determining impacts with respect to transportation and traffic under CEQA. As of the date of this analysis, the City of Calistoga has not adopted thresholds of significance related to VMT. As a result, project-related VMT impacts were assessed based on guidance published by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018. Under this guidance, residential developments that have a VMT per capita that is 15 percent or more below the existing average countywide VMT per capita would have a less-than-significant transportation impact.

The Solano Napa Activity-Based Model (SNABM) is used to analyze travel patterns and estimate VMT based on geographic areas known as transportation analysis zones (TAZs). The project parcels are located within TAZ 187, which was determined to have a per capita VMT of 9.95 while the countywide VMT per capita per the model is 14.18. Applying OPR guidance, the significance threshold is 15 percent below this level, or 12.05. Since the VMT per capita of the project TAZ is below this level, it is reasonable to conclude that the project would have a less-than-significant VMT impact.

The *Napa Valley Travel Behavior Study*, 2020, analyzed trip lengths based on trips tracked by mobile device apps. Trips with at least one end in Napa County were evaluated, and a comparison of trip lengths across all Napa County jurisdictions indicated that 48 percent of trips originating or ending in Calistoga were less than two miles in length and that the average length of trips beginning or ending in Calistoga was 10.1 miles, which was lower than all Napa County jurisdictions except the City of Napa. It is expected that future residents of the project would exhibit a similar pattern given the proximity of the project site to a wide range of destinations in Calistoga.

Finding – Since the estimated VMT per capita for the project TAZ is more than 15 percent less than the countywide average, the project can be presumed to have a less-than-significant transportation impact on VMT.

Safety Considerations

The collision history for the study segment was reviewed to determine any trends or patterns that may indicate a safety issue based on the data detailed above. The calculated collision rate for the study segment was compared to the average collision rate for similar facilities statewide, as indicated in *2020 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for segments in the same environment (urban, suburban, or rural), with the same number of lanes (two, three, or more), and similar speed limits (at or below 45 mph or above 45 mph). The study segment was compared to other conventional two-lane, urban segments under 45 mph. The study segment had a calculated collision rate above the statewide average rate, 1.87 collisions per million vehicle miles (c/mvm) versus 1.07 respectively. All three crashes were

single-vehicle incidents, and none resulted in injuries. Given that there were no injuries reported, no safety improvements appear to be warranted. The collision rate calculation is enclosed.

Finding – During the five-year study period, the collision rate for Grant Street was above the statewide average, but due to the lack of any injuries no remedial action is recommended.

Sight Distance

The site would be accessed via the proposed private roads connecting to Grant Street and Mora Avenue. Sight distances at these access points were evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distances for minor street approaches to public intersections are based on corner sight distances, with more sight distance needed for making a left turn versus a right turn. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street is evaluated based on stopping sight distance criterion. Both corner sight distance and stopping sight distance are based on the approach speed of traffic on the major street.

Given the posted speed limit of 25 mph on both Grant Street and Mora Avenue, the recommended corner sight distance to the left for drivers approaching on the minor street is 275 feet while it is 240 feet to the right. The recommended stopping sight distance for a driver following behind a vehicle turning onto the proposed private street is 150 feet. Sight lines to and from the location of the proposed intersections were measured using Google Maps imagery and were determined to extend more than 330 feet in each direction on both Grant Street and Mora Avenue which is adequate for five mph above the posted speed limits. Similarly, sight lines for a driver following behind a vehicle turning into the site were considered. Sight distance in excess of 200 feet is available for a following driver to observe and react to a vehicle turning into the site.

While sight lines from the proposed new streets are currently clear, care should be taken to maintain unobstructed sight lines and placement of signage, monuments, or other structures within the vision triangles at the driveway should be avoided. Any landscaping in the vision triangle should be lower than three feet tall for ground cover and tree canopies trimmed to be seven feet above the pavement surface.

Finding – Existing sight lines are adequate to accommodate all turns into and out of the project street.

Recommendation – To preserve existing sight lines, any new signage, monuments, or other structures should be positioned outside of the vision triangles of a driver waiting on the project road approaches. Landscaping planted in the vision triangles should be low-lying or above seven feet and maintained to remain outside the area needed for adequate sight lines.

Left-Turn Lane Warrant

The need for a left-turn lane on Grant Street was evaluated based on criteria contained in the *Intersection Channelization Design Guide*, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985, as well as an update of the methodology developed by the Washington State Department of Transportation and published in the *Method for Prioritizing Intersection Improvements*, January 1997. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes to determine the need for a left-turn pocket based on safety issues. It is noted that need for a turn lane on Mora Avenue was not evaluated as this connection is for emergency use only, so would normally serve no traffic.

Under Existing plus Project volumes, a left-turn lane is not warranted on Grant Street at the proposed street location during either of the peak periods evaluated. A copy of the spreadsheets indicating the warrant analysis are enclosed.

Finding – A left-turn lane would not be warranted on Grant Street.

Emergency Access

The proposed street would be 24 feet wide, which is adequate to accommodate two-way traffic. Interior drive aisles and parking stalls should also have been designed in accordance with City design standards. The project as proposed would include connections to both Grant Street and Mora Avenue for emergency vehicle access. The proposed width of the EVA is adequate for emergency response vehicles. Assuming that the City's design criteria are met and the Calistoga Fire Chief approves of the site circulation, site access and circulation are expected to function acceptably for emergency response vehicles. Further, as all roadway users must yield the right-of-way to emergency vehicles when using their sirens and lights, the added project-generated traffic would not appreciably affect emergency response times.

Finding – The proposed project would have a less-than-significant impact on emergency response times. Site access for emergency vehicles must be approved by the Calistoga Fire Chief.

Policy Issues

Vehicle Operation Standard

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersection was analyzed using the "Two-Way Stop-Controlled" methodology published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 6th edition, 2018. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The "Two-Way Stop-Controlled" methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Average vehicle delay is computed for the intersection as a whole and is then related to a Level of Service.

The City has established its operational standard in its General Plan as LOS D or better at all intersections during the peak hour.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operations based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. The study intersection currently operates acceptably during both the a.m. and p.m. peak hours at LOS A. A summary of the intersection Level of Service calculations is contained in Table 2. Copies of the calculations as well as the counts obtained for the analysis are enclosed.

Table 2 – Existing Peak Hour Intersection Levels of Service

Study Intersection	Weekday AM Peak		Weekday PM Peak	
	Delay	LOS	Delay	LOS
1. Grant St/Mora Ave	2.5	A	1.0	A
Southbound Mora Ave	*9.0*	*A*	*9.1*	*A*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Existing plus Project Conditions

Upon the addition of project-related traffic to the existing volumes, the study intersection would be expected to continue operating acceptably. These results are summarized in Table 3.

Table 3 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection	Existing				Existing + Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant St/Mora Ave	2.5	A	1.0	A	2.8	A	1.4	A
Southbound Mora Ave	*9.0*	*A*	*9.1*	*A*	*9.1*	*A*	*9.1*	*A*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersection is expected to operate acceptably during the a.m. and p.m. peak hours under Existing and Existing plus Project volumes.

Conclusions and Recommendations

- The proposed project would be expected to generate an average of 160 trips daily, including 12 during the morning peak hour and 16 during the evening peak hour.
- The project is consistent with City policies relative to pedestrian, bicycle, and transit facilities. The lack of frontage improvements is also consistent with City policy. The proposed bike and pedestrian pathway would provide connectivity with the local transportation network.
- The construction of a private street rather than a public street must be approved by the Planning Commission or Council and be maintained by the subdivider in a way that has been approved by both the Director of Public Works and the City Attorney or else dedicated as a public street.
- The project would have a less-than-significant impact in terms of vehicle miles traveled.
- While the study segment had an above-average collision rate, there were no injuries, so no remedial action is recommended.
- Existing sight lines are adequate to accommodate all turns into and out of the proposed project access connection to Grant Street. To preserve existing sight lines, any new signage, monuments, or other structures installed as part of the project should be positioned outside of the vision triangles of a driver waiting on the project road approaches. Landscaping planted in the vision triangle should be low-lying or above seven feet and maintained to remain outside the area needed for adequate sight lines.
- A left-turn lane is not warranted on Grant Street at the proposed project street.
- The proposed project would have a less-than-significant impact on emergency response times. The proposed project access and circulation would be expected to function acceptably for emergency response vehicles.
- The study intersection is expected to operate acceptably during both peak hours under all volumes analyzed.

We hope this information adequately addresses the potential transportation impacts associated with the project. Thank you for giving us the opportunity to provide these services.

Sincerely,

Dalene J. Whitlock, PE (Civil, Traffic), PTOE
Senior Principal

DJW/wia/CAL067.L1

Enclosures: Collision Rate Calculations, Left-Turn Warrant Sheets, LOS Calculations, Count Data

Roadway Segment Collision Rate Worksheet

2400 Grant Street TIS

Location: Grant Street

Date of Count: Thursday, January 11, 2024
Average Daily Traffic (ADT): 880

Number of Collisions: 3
Number of Injuries: 0
Number of Fatalities: 0
Start Date: January 1, 2018
End Date: December 31, 2022
Number of Years: 5

Highway Type: Conventional 2 lanes or less
Area: Urban
Design Speed: ≤45

Segment Length: 1.0 miles
Direction: East/West

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Segment Length} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{3 \times 1{,}000{,}000}{880 \times 365 \times 1 \times 5}$$

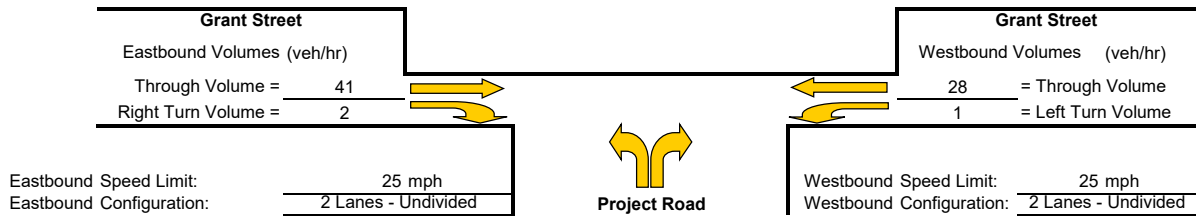
	Collision Rate	Fatality Rate	Injury Rate
Study Segment	**1.87 c/mvm**	**0.0%**	**0.0%**
Statewide Average*	**1.07 c/mvm**	**1.1%**	**43.9%**

Notes
ADT = average daily traffic volume
c/mvm = collisions per million vehicle miles
* 2020 Collision Data on California State Highways, Caltrans

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Grant Street and Project Road
Study Scenario: Existing AM Peak Hour Plus Project

Direction of Analysis Street: East/West
Cross Street Intersects: From the South



Eastbound Speed Limit: 25 mph
Eastbound Configuration: 2 Lanes - Undivided

Westbound Speed Limit: 25 mph
Westbound Configuration: 2 Lanes - Undivided

Eastbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1035.1
Advancing Volume	Va =	43
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Eastbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

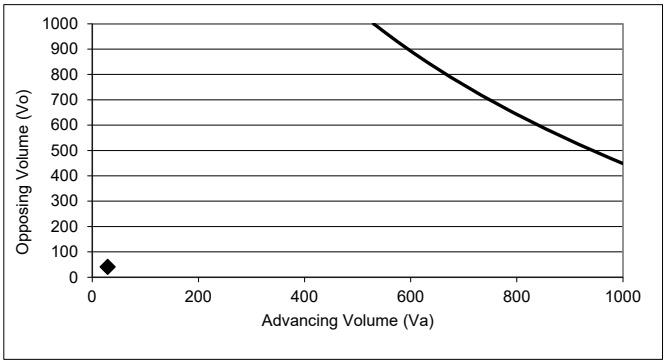
Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	43
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Westbound Left Turn Lane Warrants

Percentage Left Turns	%lt	3.4 %
Advancing Volume Threshold	AV	1599 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

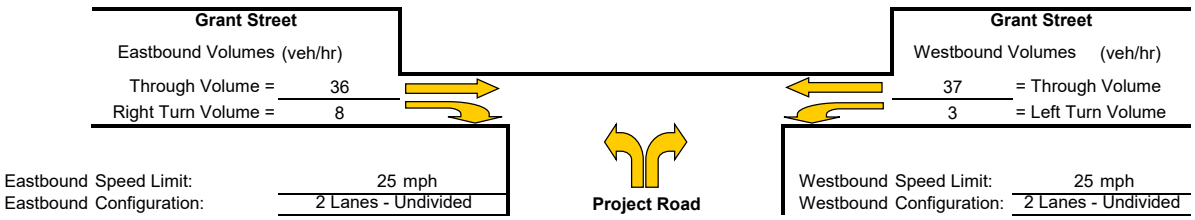
Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Grant Street and Project Road
Study Scenario: Existing PM Peak Hour Plus Projecet

Direction of Analysis Street: East/West
Cross Street Intersects: From the South



Eastbound Speed Limit: 25 mph
Eastbound Configuration: 2 Lanes - Undivided

Westbound Speed Limit: 25 mph
Westbound Configuration: 2 Lanes - Undivided

Eastbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	990.1
Advancing Volume	Va =	44
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Eastbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

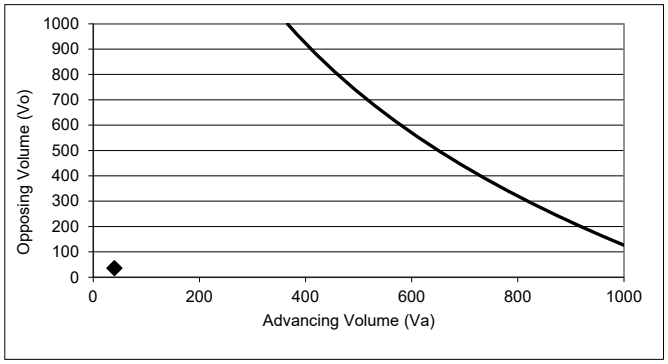
Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	44
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Westbound Left Turn Lane Warrants

Percentage Left Turns	%lt	7.5 %
Advancing Volume Threshold	AV	1109 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Intersection Level Of Service Report
Intersection 1: Grant St/Mora Ave

Control Type:	Two-way stop	Delay (sec / veh):	2.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.020

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	15	4	8	34	28	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	4	8	34	28	4
Peak Hour Factor	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	1	2	10	8	1
Total Analysis Volume [veh/h]	18	5	9	40	33	5
Pedestrian Volume [ped/h]	0		5		1	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.10	8.61	7.30	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.08	0.08	0.02	0.02	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.91	1.91	0.38	0.38	0.00	0.00
d_A, Approach Delay [s/veh]	9.00		1.34		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.48					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 1: Grant St/Mora Ave

Control Type:	Two-way stop	Delay (sec / veh):	1.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.009

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	7	1	4	34	39	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	1	4	34	39	16
Peak Hour Factor	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	1	10	11	5
Total Analysis Volume [veh/h]	8	1	5	40	46	19
Pedestrian Volume [ped/h]	0		0		2	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.11	8.60	7.35	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.03	0.03	0.01	0.01	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.76	0.76	0.21	0.21	0.00	0.00
d_A, Approach Delay [s/veh]	9.05		0.82		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.99					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 1: Grant St/Mora Ave

Control Type:	Two-way stop	Delay (sec / veh):	2.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.025

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	15	4	8	34	28	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	4	3	1	4	1	1
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	19	7	9	38	29	5
Peak Hour Factor	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	2	3	11	9	1
Total Analysis Volume [veh/h]	22	8	11	45	34	6
Pedestrian Volume [ped/h]	0		5		1	

Intersection Settings

Priority Scheme	Stop		Free		Free	
Flared Lane	No					
Storage Area [veh]	0		0		0	
Two-Stage Gap Acceptance	No					
Number of Storage Spaces in Median	0		0		0	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.20	8.65	7.31	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.10	0.10	0.02	0.02	0.00	0.00
95th-Percentile Queue Length [ft/ln]	2.53	2.53	0.46	0.46	0.00	0.00
d_A, Approach Delay [s/veh]	9.05		1.44		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.79					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 1: Grant St/Mora Ave

Control Type:	Two-way stop	Delay (sec / veh):	1.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.014

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name						
Base Volume Input [veh/h]	7	1	4	34	39	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	3	2	3	3	4	4
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	10	3	7	37	43	20
Peak Hour Factor	0.8500	0.8500	0.8500	0.8500	0.8500	0.8500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	2	11	13	6
Total Analysis Volume [veh/h]	12	4	8	44	51	24
Pedestrian Volume [ped/h]	0		0		2	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.24	8.67	7.37	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.01	0.01	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.37	1.37	0.33	0.33	0.00	0.00
d_A, Approach Delay [s/veh]	9.10		1.13		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.43					
Intersection LOS	A					

Prepared by National Data & Surveying Services

Mora Ave & Grant St

Peak Hour Turning Movement Count

ID: 24-080012-001
City: Calistoga

Day: Thursday
Date: 1/11/2024

	PEAK HOURS	COUNT PERIODS
AM	08:00 AM - 09:00 AM	7:00 AM - 09:00 AM
NOON	NONE	NONE
PM	04:45 PM - 05:45 PM	4:00 PM - 06:00 PM

SOUTHBOUND (Mora Ave)

	Right	Through	Left	U-Turn	Departing
AM	4	0	15	0	12
NOON	0	0	0	0	0
PM	1	0	6	0	19
	0	0	0	0	

WESTBOUND (Grant St)

		PM	NOON	AM
Right	0	15	0	4
Through	0	37	0	28
Left	0	0	0	0
U-Turn	0	0	0	0
Departing		38	0	48

EASTBOUND (Grant St)

	AM	NOON	PM	
Departing	32	0	38	
U-Turn	0	0	0	0
Left	8	0	4	0
Through	33	0	32	0
Right	0	0	0	0

NORTHBOUND (Mora Ave)

	Departing	U-Turn	Left	Through	Right
		0	0	0	0
PM	0	0	0	0	0
NOON	0	0	0	0	0
AM	0	0	0	0	0

CONTROL

1-Way Stop (SB)

	AM	NOON	PM
TEV	92	0	95
PHF	0.82		0.72

Totals

	Approach	Left	Through	Right
Totals (AM)	SB	15	0	4
	EB	8	33	0
	WB	0	28	4
	NB	0	0	0
Totals (NOON)	SB	0	0	0
	EB	0	0	0
	WB	0	0	0
	NB	0	0	0
Totals (PM)	SB	6	0	1
	EB	4	32	0
	WB	0	37	15
	NB	0	0	0

Total Bikes

	Approach	Left	Through	Right
Total Bikes (AM)	SB	0	0	0
	EB	0	1	0
	WB	0	0	0
	NB	0	0	0
Total Bikes (NOON)	SB	0	0	0
	EB	0	0	0
	WB	0	0	0
	NB	0	0	0
Total Bikes (PM)	SB	1	0	0
	EB	0	2	0
	WB	0	2	1
	NB	0	0	0

Pedestrians (Crosswalks)

Crosswalk	Direction	AM	NOON	PM
North	Eastbound (→)	2	0	1
North	Westbound (←)	2	0	0
West	Southbound (↓)	0	0	0
West	Northbound (↑)	5	0	0
East	Southbound (↓)	0	0	1
East	Northbound (↑)	1	0	1
South	Eastbound (→)	0	0	0
South	Westbound (←)	0	0	0
NW diagonal		0	0	0
NE diagonal		0	0	0
SW diagonal		0	0	0
SE diagonal		0	0	0