Initial Study/Mitigated Negative Declaration

Penstemon Place Project

2842, 2862, and 2574 Linwood Avenue
Santa Rosa, Sonoma County, California

January 2020

Prepared for:

City of Santa Rosa
Planning and Economic Development Department
100 Santa Rosa Avenue, Room 3
Santa Rosa, CA 95404
Contact: Susie Murray, Senior Planner

Prepared by:

Sponamore Associates
2128 Contra Costa Avenue
Santa Rosa, California 95405

1. Project Title:	Penstemon Place Project
2. Lead Agency Name & Address:	City of Santa Rosa Planning & Economic Development Department Planning Division 100 Santa Rosa Avenue Santa Rosa, California 95404
3. Contact Person & Phone Number:	Susie Murray, Senior Planner Phone number: (707) 543-4348 E-mail: smurray@srcity.org
4. Project Location:	The site is located in the City of Santa Rosa, Sonoma County, California at 2842, 2862, and 2574 Linwood Avenue Assessor's Parcel Nos. 044-200-027, 029 & 040.
5. Project Sponsor's Name & Address:	McIntosh Development, LLC P.O. Box 6858 Santa Rosa, CA 95406
6. Project Representative's Name & Address:	Carlile Macy 15 Third Street Santa Rosa, CA 95401
7. General Plan Designation:	Low Density Residential (2.0 – 8.0 units per acre)
8. Zoning:	Planned Development (PD)

9. Project Location:

The Project site comprises approximately 9.7 acres and is located at 2842, 2862, and 2574 Linwood Avenue in the Southeast quadrant of Santa Rosa. It is identified as Assessor Parcel Nos. (APN) 044-200-027, 029, and 040.

Existing rural residential and new single-family residential homes lie adjacent to the site along the northerly, westerly, and southerly boundaries. Right-of-Way for the planned Farmers Lane Extension lies immediately adjacent to the site on the East. Verbena Drive is stubbed out to the northerly boundary and will be continued onto the site. The Dauenhauer Neighborhood Park lies at the northerly end of Verbena Drive approximately 1,100 feet (less than ¼ mile) north of the site.

The site slopes generally from east to west with 80% of the site having slopes of less than 10%. The average slope of the site is 6.99%. A portion of the site includes slopes over 10%, requiring a Hillside Permit. There are currently six (6) existing single-family homes on the site dating from the 1960s, four of which are habitable and rented.

There is a total of 53 trees in the project area, of which 26 trees being removed. Of these 26 trees, 13 are exempt trees and 13 are heritage trees per the City's Tree Ordinance (Chapter 17-24 of the City Code). Four trees, all oaks (3 of which are heritage trees), may be removed if construction affects their health; these trees have been included in the mitigation calculation in the event that they are removed. The heritage trees are mostly Valley Oaks and a few Coast Oaks that exceed 18" (diameter at breast height (DBH). The 3 largest Valley Oaks (all heritage trees with diameters between 30" to 39" DBH) will be preserved. A Coast Live Oak at the northwest property line on an adjacent parcel will be protected during construction.

Google Earth

miles 1

km 2

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Vicinity Map

Figure 1

Penstemon Place Project Initial Study/Mitigated Negative Declaration

10 Project Description:

The Project proposes to develop 59 new single-family homes on lots ranging in size from 3,200 square feet to 19,300 square feet with an average of 5,900 square feet. Twelve (12) of these new homes are designed as 4-unit auto courts. Lots 53 and 13 will have secondary dwelling units. Lots 17, 29, 31 and 59 will have the option for secondary dwelling units.

The primary site design concept is to create a new walkable neighborhood of single-family homes with interconnected streets which fits with the site and the surrounding adjacent neighborhoods. To this end, the site design connects to Verbena Drive to the north and provides for the extension of Poinsettia Lane into the site from the west. The site design also seeks to save the largest valley oaks on the site and incorporate them into the new neighborhood.

An additional goal of the overall site design is to minimize the visual impact of the Project. This is planned to be accomplished by grading the homes into the hillside. The plans for the future Farmers Lane Extension already call for extensive grading along the easterly boundary of the site. Grading the homes into the site significantly below the elevation of the future Farmers Lane Extension will not only reduce the visual profile but will ensure future traffic noise from Farmers Lane does not impact homes and eliminates the need for sound walls.

Six (6) different homes have been designed for this Project. Plans 1 and 2 are designed for the auto courts. Both are 2-story homes with Plan 1 including approximately 1,661 square feet of living area and Plan 2 including approximately 1,887 square feet of living area. Plans 3 and 4 are single-story homes with Plan 3 including approximately 1,779 square feet of living area and Plan 4 including approximately 1,384 square feet of living area. Plans 5 and 6 are 2-story homes with Plan 5 including approximately 2,114 square feet of living area and Plan 6 including approximately 2,572 square feet of living area.

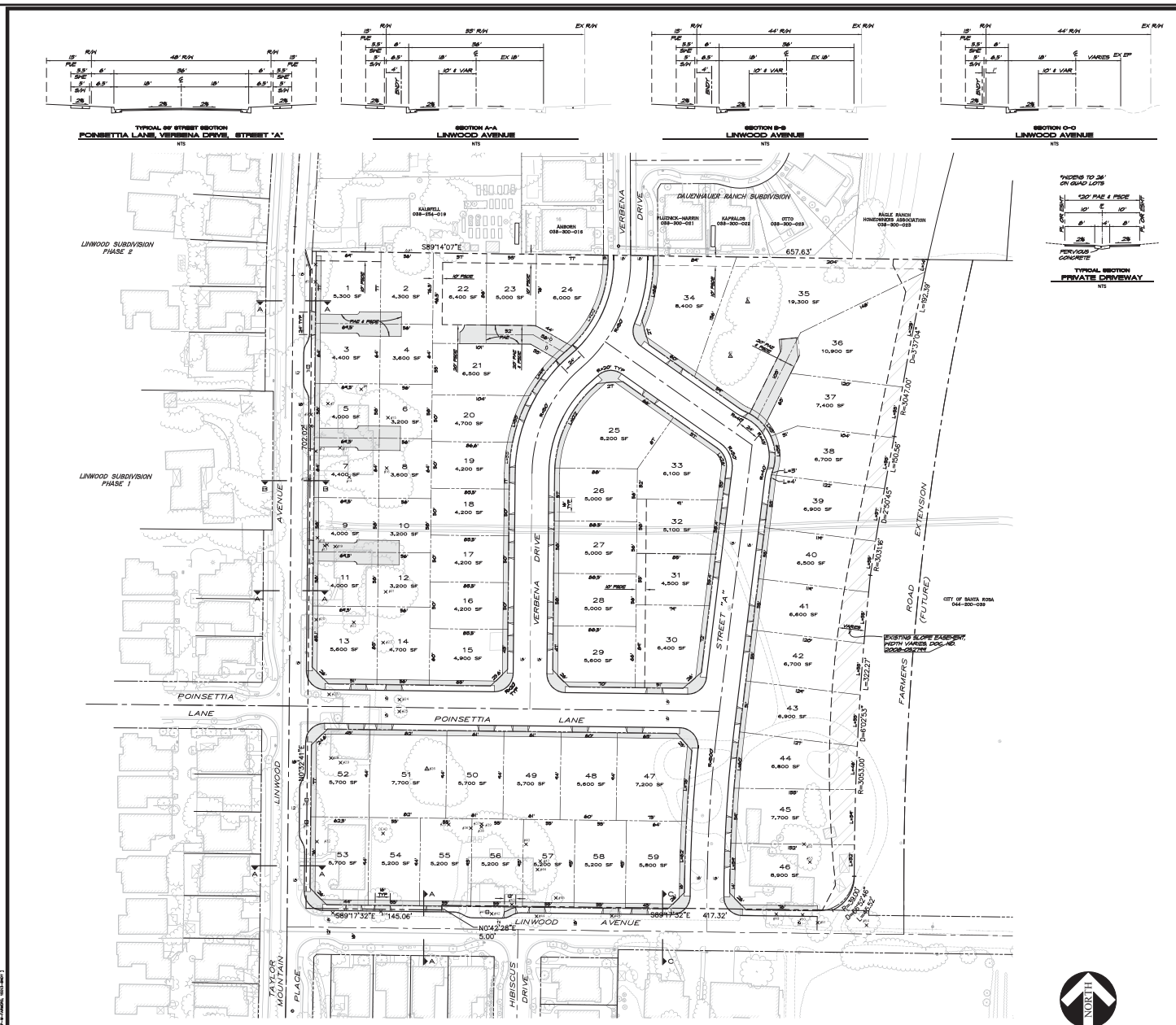
The Project site was part of the Southeast Area Plan (Area Plan) prepared in the mid 90s and an Environment Impact Report (EIR) was certified for the Area Plan in 1994 (Resolution No. 21805). The Policy Statement for the Planned Development area is still in effect; however, the Area Plan has been superseded by General Plan 2035.

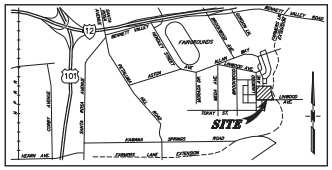
Site Improvements and Circulation

Access will be taken from three points: off Linwood Avenue along the southern edge of the property and again off Linwood Avenue along the western edge, and off Verbena Drive from the north. Twelve homes, in groups of four on three auto-courts, will take access off of Linwood Avenue. Landscaped front yards, rather than driveways, will be the first impression visitors have of the Project. Poinsettia Lane will extend onto the site from the west.

The Project site has been designed to allow pedestrian connections and circulation throughout the Project, as well as to the adjacent streets and community. There will be sidewalks installed along all of the interior and exterior streets and along the Project frontage on Linwood Avenue. All homes will be landscaped with native and/or drought tolerant plantings and will provide irrigations systems that meet the requirements set forth in the current Water Efficient Landscape Ordinance (WELO).

The Project will incorporate Low Impact Development (LID) measures as called for in the City of Santa Rosa's LID manual. The City's LID manual requires the inclusion of LID features to capture and infiltrate small storm event volumes on-site. The Project's Standard Urban Storm Water Mitigation Plan (SUSMP) incorporates many LID measures into the Project design including capture of surface runoff, detention and infiltration, permeable pavement and bioretention. These features are described in detail in Attachment I.





VICINITY MAP

NTS

LEGEND

SUBDIVISION BOUNDARY
LOT LINE
RIGHT-OF-WAY
STREET GRADE 0.50%
STREET LIGHT
WATER (PVC), FIRE HYDRANT, BLOWOFF
SEWER (PVC), MANHOLE, CLEAN OUT
STORM DRAIN (RCP), CATCH BASIN, DROP INLET
RETAINING WALL
SLOPE
EXISTING CONTOUR
PROPOSED CONTOUR 250
EXISTING FLOWLINE
VEGETATIVE SWALE
PUBLIC STORM DRAIN EASEMENT ..... SDE
PRIVATE STORM DRAIN EASEMENT ..... PSDE
PRIVATE ACCESS EASEMENT ..... PAE
EXISTING TREES: SAVE ..... REMOVE ..... MAY REMOVE .....
(SEE ARBORIST'S REPORT AND PRELIMINARY LANDSCAPE PLAN FOR MORE INFORMATION)
SUSMP BMP F2-C2

PROJECT DATA

ADDRESS ..... 2974, 2942, 2982 LINWOOD AVENUE
ASSESSOR'S PARCEL NUMBER 044-200-027, 044-200-028, 044-200-040
TOTAL GROSS ACREAGE ..... 9.73 ACRES
GENERAL PLAN LAND USE ..... LOW DENSITY RESIDENTIAL
ZONING: EXISTING ZONING ..... PD PROPOSED ZONING ..... PD
DENSITY ..... 6.06 DU/AC.
LOT SIZE: ..... SMALLEST - 5,200 S.F., LARGEST - 11,900 S.F., AVERAGE - 8,400 S.F.
WATER SUPPLY ..... CITY OF SANTA ROSA
SEWAGE DISPOSAL ..... CITY OF SANTA ROSA, KAWAHA-YULANDA TRUNK
SEWAGE PEAK FLOW GENERATION ..... 74,000 GPD

BENCH MARK

CITY OF SANTA ROSA BENCHMARK B-8A, BENNETT VALLEY ROAD AND FARMERS LANE. A 5" BRASS DISC IN WELL MARKED CSBC (CITY COORDINATE MONUMENT G-28)
ELEV. = 228.08 (NGVD 1929)

NOTES

1. ALL STREETS ARE PUBLIC UNLESS OTHERWISE SHOWN.
2. ALL PAD ELEVATIONS ARE ABOVE 100-YEAR FLOOD ELEVATION.
3. ALL SEPTIC SYSTEMS AND WELLS WILL BE REMOVED IN ACCORDANCE WITH SONOMA COUNTY HEALTH DEPARTMENT REGULATIONS.
4. ENGINEER IS NOT AWARE OF ANY ADVERSE SOIL CONDITIONS THAT WOULD PRECLUDE THIS TYPE OF DEVELOPMENT.
5. ENGINEER IS NOT AWARE OF ANY HAZARDOUS MATERIALS ON SITE.
6. ALL EXISTING STRUCTURES ARE TO BE REMOVED.
7. ALL EXISTING TREES WITHIN R/W ARE TO BE REMOVED UNLESS OTHERWISE SHOWN.
8. STORM DRAIN SIZES SHOWN ARE APPROXIMATE ONLY. EXACT SIZE WILL BE DETERMINED WITH IMPROVEMENT PLANS AND CALCULATIONS.
9. SEWER INVERT ELEVATIONS SHALL BE BASED UPON THE FINAL DESIGN OF INFRASTRUCTURE SEWER IMPROVEMENTS.
10. SUBDIVIDER INTENDS TO RESERVE THE RIGHT TO FILE MULTIPLE FINAL MAPS FOR THIS PROJECT PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT.

TENTATIVE MAP

PENSTEMON PLACE

SANTA ROSA, CALIFORNIA

59 LOTS 9.73 ACRES MAY 2018

BEING A SUBDIVISION OF THE LANDS OF McINTOSH DEVELOPMENT, LLC AS DESCRIBED BY DEED RECORDED UNDER DOCUMENT No. 2015-018515, OF OFFICIAL RECORDS OF SONOMA COUNTY, STATE OF CALIFORNIA.

OWNER / DEVELOPER
McINTOSH DEVELOPMENT, LLC
2280 Cleveland Avenue, Suite B
Santa Rosa, CA. 95403
(707) 544-7144

ENGINEER & SURVEYOR
CARLILE MACY
15 Third Street
Santa Rosa, CA. 95401
(707) 542-6451

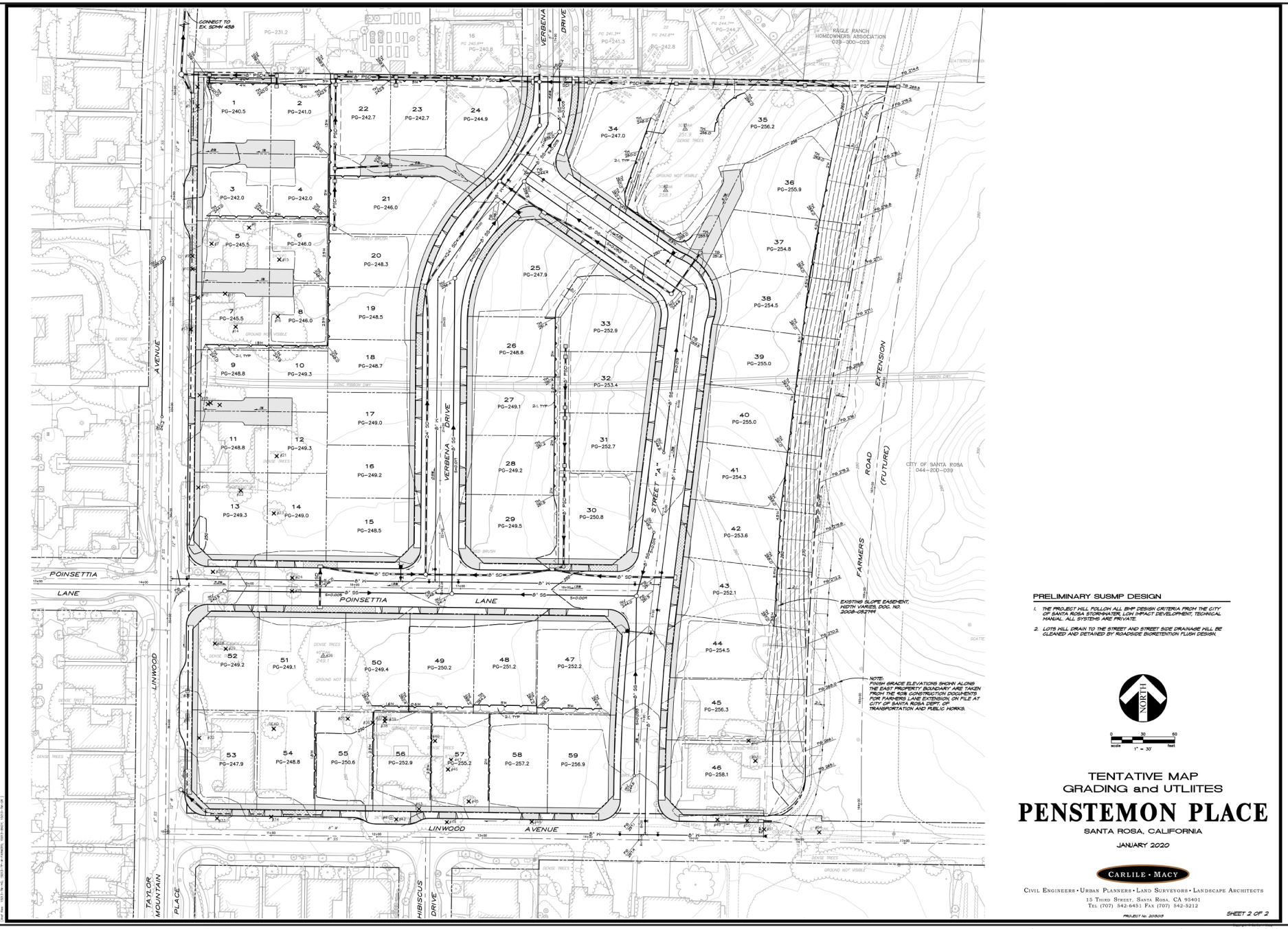
REGISTERED PROFESSIONAL ENGINEER MARK R. HALL No. 43973 CIVIL STATE OF CALIFORNIA

REGISTERED LAND SURVEYOR JAMES LEE SMITH No. 8185 STATE OF CALIFORNIA

MARK R. HALL, PE 43973 DATE JAMES LEE SMITH, PLS 8185 DATE

CARLILE • MACY
CIVIL ENGINEERS • URBAN PLANNERS • LAND SURVEYORS • LANDSCAPE ARCHITECTS
15 THIRD STREET, SANTA ROSA, CA 95401
TEL (707) 542-6451 FAX (707) 542-5212

PROJECT No 30225.00 SHEET 1 OF 2



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Tentative Map - Grading & Utilities

Figure 2b

Penstemon Place Project Initial Study/Mitigated Negative Declaration

TREE MITIGATION SUMMARY

SYMBOL	BOTANICAL / COMMON NAME
X" TREE	EXISTING TREES TO REMAIN
	△ TO REMAIN □ MAY BE REMOVED
X" TREE	EXISTING TREES TO BE REMOVED

TREES TO BE REMOVED:	TOTAL DIAMETER TO BE REMOVED
ALL FRUIT & NUT TREES	EXEMPT
ALL FRUITLESS MULBERRY	EXEMPT
ALL BLACK ACACIA	EXEMPT
ALL MONTEREY PINE	EXEMPT
ALL SILVER MAPLE	EXEMPT
VALLEY OAKS / QUERCUS LOBATA	157"
COAST LIVE OAKS / QUERCUS AGRIFOLIA	242"
LONDON PLANES / PLATANUS X ACERFOLIA	74"
HACKBERRY / CELTIS SP.	5"
BLACK WALNUT / JUGLANS NIGRA	54"
MEXICAN FAN PALM / WASHINGTONIA ROBUSTA	17"
TOTAL DIAMETER TO BE MITIGATED	604"
TOTAL REQUIRED MITIGATION TREES	201

1. TOTAL REQUIRED MITIGATION "TREES" IS EXPRESSED IN NUMBER OF 15 GALLON REPLACEMENT TREES REQUIRED, AT THE RATE OF (2) REPLACEMENT TREES FOR EACH 6" (OR FRACTION THEREOF) OF TRUNK CALIPER (DBH) OF TREES TO BE REMOVED PER SANTA ROSA CITY CODE (TITLE 17, CHAPTER 24).
2. SEE "ARBORISTS REPORT DATED MAY 2018 AND "TREE MITIGATION TABULATION" AND "REPLACEMENT TREE TABULATION" DATED MAY 2018 FOR ADDITIONAL INFORMATION.
3. DEVELOPER SHALL SUBMIT A "TREE REPLACEMENT PLAN" OR PAY THE APPROPRIATE MITIGATION FEE PRIOR TO ISSUANCE OF BUILDING PERMIT.

PLANT LEGEND

TREES: (SYMBOLS SHOWN HALF SIZE) KEY	BOTANICAL NAME/COMMON NAME	SIZE	QTY	H/C/D/S
T1	ULMUS PARVIFOLIA 'ALLEE' / CHINESE EVERGREEN ELM	24" BOX / 15 GAL	15 /56	LOW
T2	LAGERSTROEMIA INDICA VARIETIES / CRAPE MYRTLE	15 GAL	85	LOW
T3	GINKGO BILOBA 'PRINCETON SENTRY' / MAIDENHAIR TREE	15 GAL	26	LOW
T4	ACER RUBRUM 'BOWHALL' / BOWHALL RED MAPLE	15 GAL	54	MED
T5	QUERCUS AGRIFOLIA / COAST LIVE OAK	15 GAL	20	LOW

EXISTING TREE TO REMAIN

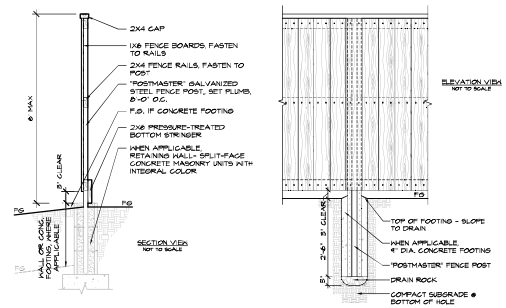
X" TREE

LANDSCAPE AREAS:

KEY	DESCRIPTION
	PRIVATE REAR YARD LANDSCAPES - HOMEOWNER INSTALLED
	FRONT YARD LANDSCAPES - DEVELOPER INSTALLED
	6' TALL SOLID WOOD PRIVACY FENCE (SEE DETAIL F1)
	SITE RETAINING WALL (SEE CIVIL DRAWINGS)
	MAILBOXES (SHOWN FOR REFERENCE ONLY)

GENERAL NOTES

1. LANDSCAPE PLANTINGS AND IRRIGATION WILL BE DESIGNED AND INSTALLED IN COMPLIANCE WITH SANTA ROSA'S ORDINANCE 4051, WATER EFFICIENT LANDSCAPE ORDINANCE (WELO).
2. STREET TREES WILL BE PLANTED PER CITY OF SANTA ROSA STANDARDS FOR PARKWAY TREE PLANTINGS.
3. STREET TREES WILL BE IRRIGATED BY BUBBLERS INCLUDED WITH PRIVATE LOT, FRONT YARD LANDSCAPE IRRIGATION SYSTEMS.
4. ROOT BARRIERS WILL BE INSTALLED PER CITY STANDARD DETAIL.
5. NURSERY TRAINING STAKES SHALL BE REMOVED FROM ALL TREES AT TIME OF PLANTING. TREES TO BE STAKED AS SHOWN IN THE CITY STANDARD DETAIL. ANY "TREE WHICH CANNOT SUPPORT ITSELF WHEN STAKED IN THIS MANNER WILL BE REJECTED.
6. TREE LOCATIONS MAY BE ADJUSTED AS NEEDED TO ACCOMODATE UTILITIES.



F1 **SOLID WOOD PRIVACY FENCE**

NO SCALE

NORTH

SCALE 1" = 40'

L-1
PRELIMINARY
LANDSCAPE MASTER PLAN

PENSTEMON PLACE

SANTA ROSA, CALIFORNIA
MAY 2018

PREPARED BY:

CARLLE • PLAC

CIVIL ENGINEERS • URBAN PLANNERS • LAND SURVEYORS • LANDSCAPE ARCHITECTS
15 THIRD STREET, SANTA ROSA, CA 95401
TEL (707) 542-6451 FAX (707) 542-5212

PROJECT No. 2050.03.00

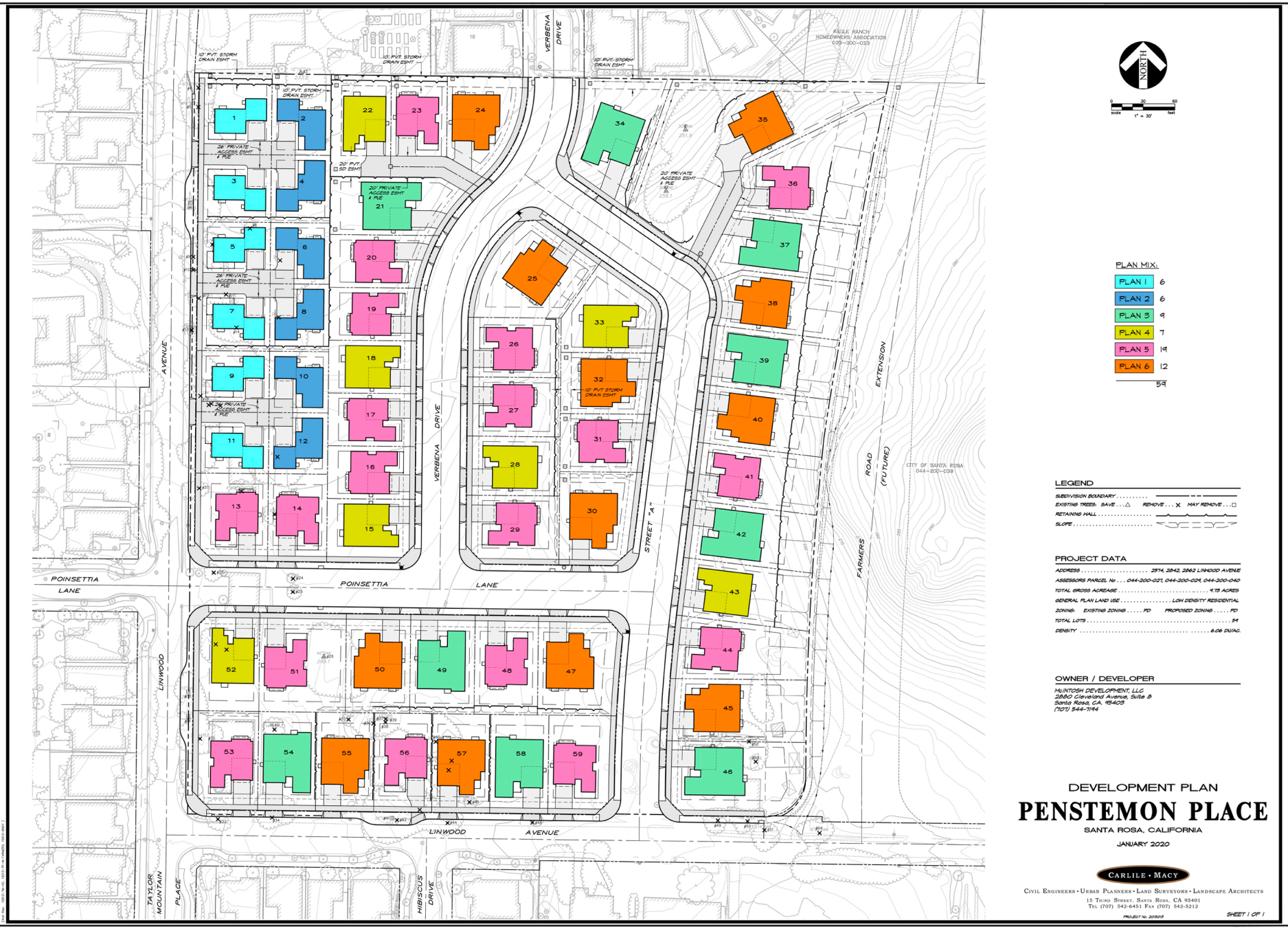
SHEET 1 OF 2

SPONAMORE ASSOCIATES

Landscape Plan

Figure 3

Penstemon Place Project Initial Study/Mitigated Negative Declaration



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Development Plan

Figure 4

Penstemon Place Project Initial Study/Mitigated Negative Declaration

Green Technologies

Energy and water efficient design measures will be incorporated throughout the Project as described in the table below, and required by state or local regulation, in addition to water efficient landscaping consisting of native and drought tolerant plant species separated into hydro-zones for irrigation needs. Planting plans will call for new trees and shrubs to complement other neighboring developments. Additionally, all of the homes in the Project will include energy efficient appliances, high efficiency lighting, and low-flow plumbing faucets and fixtures. The applicant will also utilize a construction waste recycling program during construction to minimize waste, see Table 1. Additionally, the Penstemon Place Project incorporates all of the applicable policy measures contained the City's Climate Action Plan (CAP). These are discussed in Section VIII Greenhouse Gases.

Table 1: Green Technologies

Energy Efficiency	Lighting	Plumbing	Construction Materials
• Energy Efficient Heating & Cooling • Increased Insulation • Energy Efficient Appliances	• Energy Efficient Lighting	• Low Flow Faucets • Low Flow Plumbing Fixtures • Metered Plumbing Fixtures • Hydro-zone Irrigation	• Construction Waste Recycling

Construction

Construction would take approximately 15 months, including on-site grading. Construction is anticipated to begin in fall/winter of 2020. Construction hours are limited to 7:00 AM to 7:00 PM, Monday-Friday and 8:00 AM to 5:00 PM on Saturdays, with no construction activities permitted on Sundays or holidays.

Environmental Significance

In determining the level of significance of environmental impacts associated with the proposed project, the analysis in this document assumes that the proposed project would comply with relevant federal and state laws and regulations, City General Plan policies, ordinances, and other adopted City documents, unless otherwise noted. Therefore, such mandatory policies, ordinances, and standards are not identified as mitigation measures, but rather are discussed under the heading of Standard Measures summarized in each section of this document.

11. Other Public Agencies Whose Approval Is Required:

The Penstemon Place Project requires the following discretionary approvals from the City of Santa Rosa: Conditional Use Permit for a small lot subdivision; Tentative Map for a 59-lot residential subdivision, and a Hillside Development Permit for development on slopes greater than ten percent.

Other required permits include:

Grading Permit (City of Santa Rosa)
Building Permit (City of Santa Rosa)
North Coast Regional Water Quality Control Board (NCRWQCB) (Section 401, Clean Water Act)
United States Army Corps of Engineers (USACOE) (Section 404, Clean Water Act)

12. Exhibits

Figure 1.	Vicinity Map
Figure 2a	Tentative Map
Figure 2b	Tentative Map – Grading & Utilities
Figure 3.	Landscape Plan
Figure 4	Development Plan

Attachment A:	Mitigation Monitoring and Reporting Program
Attachment B:	Draft Traffic Impact Study
Attachment C:	CAP New Development Checklist
Attachment D-1:	Biological Resource Assessment
Attachment D-2:	Jurisdictional Wetlands Delineation Report
Attachment D-3	Arborist's Report
Attachment D-4	Tree Mitigation Tabulation
Attachment E:	Environmental Noise Assessment
Attachment F:	Geotechnical Study Report
Attachment G:	Phase I Environmental Site Assessment
Attachment H:	Community Risk Assessment (Air Quality)
Attachment I:	Preliminary Standard Urban Storm Water Mitigation Plan
Attachment I-1:	Drainage Areas & Storm Drain Connections
Attachment J:	Cultural Resources Study

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this Project. Please see the checklist for additional information.

☐	Aesthetics	☐	Agriculture and Forestry	☒	Air Quality
☒	Biological Resources	☐	Cultural Resources	☐	Energy
☐	Geology/Soils	☐	Greenhouse Gas Emissions	☒	Hazards and Hazardous Materials
☐	Hydrology	☐	Land Use Planning	☐	Mineral Resources
☒	Noise	☐	Population/Housing	☐	Public Services
☐	Recreation	☒	Transportation	☐	Tribal Resources
☐	Utilities/Service Systems	☐	Wildfire	☐	Mandatory Findings of Significance

I. AESTHETICS

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Discussion:

The approximately 9.7-acre Project site is located in a developing area in southeast Santa Rosa. The site is located east of Linwood Avenue on a sloping parcel west of the future Farmers Lane Extension. The site has been envisioned for this type of development since 1994, when the Southeast Area Plan was approved. The surrounding neighborhood includes single-family residential subdivisions to the north, west and south.

The 59 units will have a variety of sidings (combinations of shingle, lap or board and batten), varied roof lines and attached two-car garages. Most of the homes are designed to front onto the internal streets to provide a pleasant and walkable streetscape with front doors and front yards facing the street. Street landscaping will include street trees and sidewalks. The Project includes full frontage improvements along Linwood Avenue including landscaping, sidewalk, and other improvements. New plantings call for trees and shrubs to complement other neighboring developments. Twelve of the homes are designed to be on four-home auto courts off Linwood Avenue and to front onto interior courts. The interior of these homes provides a varied streetscape allowing an increased landscape area. In addition to the varying home sizes, four of the homes (lots 17, 29, 31 and 59) include accessory dwelling units.

The site has been designed to allow pedestrian connections and circulation throughout the Project, as well as connectors to the adjacent streets and subdivisions. Throughout the neighborhood, landscaped streetscapes with sidewalks in front of each home will provide a pleasant pedestrian path of travel. Three access points to the site are proposed: (1) from Verbena Drive to the north, (2) off Linwood Drive (westerly opposite frontage) with Poinsettia Lane (completing the fourth leg of the intersection), and (3) from Linwood Avenue to the south about 180 feet east of Hibiscus Drive. An all-way stop-control warrant analysis was performed for the proposed four-legged intersection of Linwood Avenue and Poinsettia Lane and concluded that all-way stop control is needed to achieve safe operation of the intersection as noted in the Traffic Study included as Attachment B of this report.

Landscaping for the Project will consist of native and/or drought tolerant plant species and hydro-zones will be utilized to make efficient use of water in compliance with the City of Santa Rosa's Water Efficient Landscape Ordinance adopted on December 1, 2015 (WELO).

I(a,b) **Less Than Significant Impact. Scenic Vistas, Visual Resources.** The Project site is not located within or along a designated scenic corridor nor does it contain scenic resources, nor does the Project itself affect a scenic vista or other scenic resources (trees, rock outcroppings or historic buildings) related to a scenic highway. The Project site is not visible from any scenic highways. The City of Santa Rosa's General Plan depicts Linwood Avenue as a residential street. The Project will provide improvements onsite including street trees and landscaping within the planter strip and sidewalk, consistent with the City of Santa Rosa's Tree Ordinance. The Project will not conflict with any local policies or ordinances protecting scenic resources, policies or ordinances, and will not result in any significant impacts.

I(c) **Less Than Significant Impact. Visual Character.** The Project meets the objectives of the City's Design Guidelines pertaining to neighborhood design and single-family residential development by providing a variety of single-family housing types at different price ranges, providing an interconnected street network of walkable blocks, providing streets designed to accommodate pedestrians and bicycles as well as automobiles, and preserving the largest existing oak trees and incorporating them into the plan. There are three existing, large trees to be preserved. Two trees are in a stand together near the northeastern corner of the property, and the other is solitary near the southwest corner. All three trees are in good or excellent condition with expansive canopies, and the project has been designed to preserve and maintain them.

The site is surrounded to the north, south and west by existing development similar to the proposed residential development. The proposed homes will be set below (downslope) of the future Farmers Lane Extension, which is to be landscaped. Therefore, future views from Farmers Lane Extension will be protected and the Project will not be visible from the Farmers Lane Extension.
The Project will not substantially degrade the existing visual character or quality of the site and its surroundings. It will continue the residential development pattern called for in the City's General Plan in a manner consistent with the City's design standards, which is compatible with the surrounding community. Therefore, the Project will not result in any significant impacts.

I(d) **Less Than Significant Impact. Light and Glare.** The City of Santa Rosa Zoning Code (Code) Section 20-30.080 requires that lighting fixtures be shielded or recessed to reduce light bleed to adjoining properties, and that each light fixture be directed downward and away from adjoining properties and public rights-of-way, so that no on-site light fixture directly illuminates an area off the site. The Project shall demonstrate that lighting has been designed to be adequate without spilling off the property to ensure compliance with City requirements. Compliance with these requirements will ensure that the Project will not create a new source of substantial light or glare which would adversely affect day or nighttime views in the area and, therefore, will not result in any significant impacts.

Mitigation Measures:

None required

Standard Measures:

- A standard condition of approval regarding exterior lighting requirements will be placed on the Project. Conformance review shall occur at the building permit stage.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa Zoning Code, 2006
- City of Santa Rosa Design Guidelines, September 2005 (updated in 2010, 2011)
- City of Santa Rosa, Water Efficient Landscape Ordinance, Ordinance 4051, adopted October 27, 2015

II. AGRICULTURE and FOREST RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☒	☐

Discussion

The site has not been cultivated or used for active farming. While the property is designated as "Other" by California Department of Conservation Division of Land Resources Protection, Farmland Mapping and Monitoring Program (2012), the City of Santa Rosa has designated and zoned this site for Low Density Residential uses for 20± years. The site's historical uses were reviewed as part of the Phase I Environmental Site Assessments prepared by Harris & Lee Environmental Sciences, LLC (Attachment G).

II(a,b,e) **Less Than Significant Impact. Designations or Zoning.** The Project site is not designated Prime Farmland, Unique Farmland, or Farmland of Statewide Significance on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency. The Project site is located within Santa Rosa's Urban Growth Boundary and has long been zoned for residential development. The site is in the Planned Development (PD) zoning district and, as such, commercial agricultural uses are prohibited. Adjacent properties to the north, south and west are similarly zoned for urban use. Properties to the southeast are currently developed residential uses (semi-rural 5± acre lots). Their agricultural capability is limited. The eastern property line is the site of the future Farmers Lane Extension. The Project is expected to have a less than significant or no impact on conversion of farmland or existing agricultural uses.

II(b) **No Impact. Williamson Act.** The Project site is currently and has long been designated for residential uses which are not generally compatible with commercial agricultural uses. The Project site is

not under a Williamson Act contract. Therefore, the Project would not impact existing agricultural zoning or Williamson Act contract for the property.

II(c-d) **No Impact. Forest Resources.** The site is in an urban area that is projected for development with limited trees on-site and no forest resources on or near the site. Therefore, the Project would have no impact to forest resources.

Mitigation Measures:

None required

Sources

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa Zoning Code, 2006
- Harris & Lee Environmental Sciences, LLC, Phase I Environmental Site Assessments, April 2015

III. AIR QUALITY

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations				
Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b. Result in a cumulatively considerable net increase of a criteria pollutant for which the project region is non-attainment under applicable federal or state ambient air quality standard?	☐	☒	☐	☐
c. Expose sensitive receptors to substantial pollutant concentrations?	☐	☒	☐	☐
d. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

Discussion:

The Project has been evaluated by Illingworth & Rodkin for air pollutant emissions from construction and operation of the project and potential construction-related health risks. The report, dated March 8, 2017, and supporting modelling calculations, is included as Attachment H to this Initial Study.

The Project site is located in the City of Santa Rosa, within the boundaries of the San Francisco Bay Area Air Basin. The Bay Area Air Quality Management District (BAAQMD) is the regional agency with regulatory authority over stationary sources in the San Francisco Bay Area Air Basin, while the California Air Resources Board (CARB) has regulatory authority over mobile sources such as construction equipment, trucks, and automobiles throughout the state. The BAAQMD has the primary responsibility to meet and maintain the state and federal ambient air quality standards in the Bay Area. The Bay Area meets all ambient air quality standards for all state standards except ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$) as the Air basin has been in attainment since 1998 (officially). The air basin meets all other ambient air quality standards.

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NOx). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduce lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant of the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM10) and fine particulate matter where particles have a diameter of 2.5 micrometers or less (PM2.5). Elevated concentrations of PM10 and PM2.5 are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic air contaminants or TACs are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, and fuel combustion. TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter [DPM] near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State, and Federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the State's Proposition 65 or under the Federal Hazardous Air Pollutants programs.

Regulatory Environment:

CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of DPM. Several of these regulatory programs affect medium and heavy-duty diesel trucks that represent the bulk of DPM emissions from California highways. CARB regulations require on-road diesel trucks to be retrofitted with particulate matter controls or replaced to meet 2010 or later engine standards that have much lower DPM and PM2.5 emissions. This regulation will substantially reduce these emissions between 2013 and 2023. While new trucks and buses will meet strict federal standards, this measure is intended to accelerate the rate at which the fleet either turns over so there are more cleaner vehicles on the road or is retrofitted to meet similar standards. With this regulation, older, more polluting trucks would be removed from the roads sooner.

In June 2010, the BAAQMD's Board of Directors adopted CEQA thresholds of significance and an update of their CEQA Guidelines. These thresholds were designed to establish the level at which BAAQMD believed air pollution emissions will cause significant environmental impacts under the CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (BAAQMD 2017a). The significance thresholds identified by BAAQMD, as shown below in Table III-1, represent an appropriate approach and are used as a guideline in this analysis.

Table III-1: Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
Criteria Air Pollutants			
ROG	54	54	10
NOx	54	54	10
PM10	82 (Exhaust)	82	15
PM2.5	54 (Exhaust)	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for Single Sources			
Excess Cancer Risk	>10 per one million		
Hazard Index	>1.0		
Incremental annual $PM_{2.5}$	>0.3 µg/m^3		
Health Risks and Hazards for Combined Sources (Cumulative from all sources within 1,000-foot zone of influence.			
Excess Cancer Risk	>100 per one million		
Hazard Index	>10.0		
Annual Average $PM_{2.5}$	>0.8 µg/m^3		
Note: ROG=reactive organic gases, NOx=nitrogen oxides, PM_{10}=course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$=fine particulate matter or particulates with an aerodynamic diameter of 2.5 µm or less			

The City of Santa Rosa's Open Space and Conservation Element contains polices meant to improve and maintain air quality and impacts to the community from air pollution. Specific policies applicable to the Project include:

OSC-J-1 Review all new construction projects and require dust abatement actions as contained in the CEQA Handbook of the Bay Area Air Quality Management District.

OSC-J-3 Reduce particulate matter emissions from wood burning appliances through implementation of the city's Wood Burning Appliance code.

Consistent with the Santa Rosa 2035 General Plan recommendations, the Project shall be required to include the City's dust abatement conditions of approval and/or the BAAQMD's dust abatement mitigations. No wood burning fireplaces are allowed in new construction.

Impacts:

III(a) Less than Significant. Conflict with Air Quality Plan. The Bay Area is considered a non-attainment area for ground-level ozone and PM2.5 under both the Federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the Federal act. The area has attained both State and Federal ambient air quality standards for carbon monoxide. As part of an effort to attain and maintain ambient air quality standards for ozone and PM_{10}, the BAAQMD has established thresholds of significance for these air pollutants and their precursors. The main purpose of an air quality plan is to bring the area into compliance with the

requirements of federal and state air quality standards. To bring the San Francisco Bay Area region into attainment, the BAAQMD developed the 2017 Bay Area Clean Air Plan (BAAQMD 2017b). BAAQMD's 2017 Clean Air Plan focuses on protecting public health and protecting the climate. Because the Project will not conflict with the applicable air quality plan, there will be no impact.

III(b) Less Than Significant Impact with Mitigation Incorporation. Construction and Operational. The Project will include demolition and construction activities that will result in short-term air quality impacts from combustion emissions and fugitive dust emissions. There will also be long-term emissions associated with Project-related vehicle trips. The two issues are discussed below along with mitigation measures. These measures have been judged by BAAQMD to reduce potential dust related impacts to a level of less than significant. These thresholds are for ozone precursor pollutants (ROG and NOx), PM_{10}, and $PM_{2.5}$ and apply to both construction period and operational period impacts.

Construction

CalEEMod provided annual emissions for construction. CalEEMod provides emission estimates for both on-site and off-site construction activities. On-site activities are primarily made up of construction equipment emissions, while off-site activity includes worker, hauling, and vendor traffic. A construction build-out scenario, including equipment list and schedule, was based on information provided by the Project applicant. The air quality report (Attachment H) describes the air quality modelling and contains the technical detail. The construction assumptions and modeling output are contained in Attachment H. The Proposed Project land uses were input into CalEEMod, which included: 59 dwelling units entered as "Single-Family Housing" on a 9.7-acre site (a conservative estimate as the Project replaces 6 existing homes).

Approximately 15,860 cubic yards (cy) of soil export is anticipated during grading along with demolition of 20,000 square feet (sf) of building and were entered into the model. Additionally, 94 cement truck roundtrips during building construction and 78 paving roundtrips are expected and were entered into the model. Modeling assumed 16 cy/truck and 20 tons/truck.

Construction activities, particularly during site preparation and grading, would temporarily generate fugitive dust in the form of PM10 and PM2.5. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries (Table III-2). The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are implemented to reduce these emissions.

Table III-2: Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust
Total construction emissions (tons)	1.21 tons	3.84 tons	0.19 tons	0.17 tons
Average daily emissions (lbs) [1]	5.5 lbs.	17.5 lbs	0.9 lbs	0.8 lbs
BAAQMD Thresholds (lbs per day)	54 lbs	54 lbs	82 lbs	54 lbs
Exceed Threshold?	No	No	No	No
Notes: [1]Assumes 440 workdays.				

Operational Emissions

Operational emissions were also predicted using CalEEMod and reported in Table III-3. These emissions, which include vehicle travel and on-site emissions from the homes, were found to be well below the significance thresholds.

Table III-3: Operational Period Emissions

Scenario	ROG	NOx	PM_{10}	$PM_{2.5}$
Total annual emissions (tons)	1.10 tons	1.04 tons	0.57 tons	0.22 tons
BAAQMD Thresholds (tons)	10	10	15	10
Average daily emissions (lbs) [1]	6.0 lbs.	5.7 lbs	3.1 lbs	1.2 lbs
BAAQMD Thresholds (lbs per day)	54 lbs	54 lbs	82 lbs	54 lbs
Exceed Threshold?	No	No	No	No
Notes: [1]Assumes 365 days.				

As discussed above, the Project would have emissions less than the BAAQMD thresholds for evaluating impacts related to ozone and particulate matter. Therefore, the Project would not contribute substantially to existing or projected violations of those standards. Carbon monoxide emissions from traffic generated by the Project would be the pollutant of greatest concern at the local level. Congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of carbon monoxide. Air pollutant monitoring data indicate that carbon monoxide levels have been at healthy levels (i.e., below State and Federal standards) in the Bay Area since the early 1990s. As a result, the region has been designated as attainment for the standard. The highest measured level over any 8-hour averaging period during the last 3 years in the Bay Area is less than 3.0 parts per million (ppm), compared to the ambient air quality standard of 9.0 ppm. Intersections affected by the Project would have traffic volumes less than the BAAQMD screening criteria of 44,000 total vehicle movements in an intersection during the busiest hour and, thus, would not cause a violation of an ambient air quality standard or have a considerable contribution to cumulative violations of these standards. Cumulative impacts on sensitive receptors are discussed in Section III(c), below.

Implementation of the eight measures recommended by BAAQMD, some of which have been adopted by the City as Standard (construction) Measures, are included below as Mitigation Measures AIR-1. These measures have been judged (by BAAQMD), to reduce potential dust related impacts to a level of less than significant. These mitigation measures apply to both construction period impacts and would reduce potential impacts to levels of less than significant.

III(c) Less than Significant with Mitigation Measure Incorporation. Sensitive Receptors. Project impacts related to increased community risk can occur either by introducing a new sensitive receptor, such as a residential use, in proximity to an existing source of TACs or by introducing a new source of TACs with the potential to adversely affect existing sensitive receptors in the Project vicinity. The BAAQMD recommends using a 1,000-foot screening radius around a project site for purposes of identifying community health risk from siting a new sensitive receptor or a new source of TACs. Operation of the Project is not expected to cause any localized emissions that could expose sensitive receptors to unhealthy air pollutant levels.

There are cumulative community risk thresholds used to evaluate construction impacts on sensitive receptors. The cumulative impacts of TAC emissions from construction of the Project and expected traffic on Farmer Lane Extension on the construction maximally exposed individual (MEI) are summarized in Table III-4. The sum of impacts from combined sources at the construction MEI would be below the thresholds of significance and this impact would be considered less-than-significant.

Table III-4: Cumulative Construction Risk Assessment

Source	Maximum Cancer Risk (per million)	Maximum Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Maximum Hazard Index
Project Construction Unmitigated Mitigated	 59.1 6.5	 0.61 <0.10	 0.05 <0.01
Future Farmers Lane Extension (200 ft. west for cancer risk and 330 ft. west for $PM_{2.5}$)	1.6	0.03	<0.01
Cumulative Total Unmitigated Mitigated	 60.7 8.1	 0.64 <0.13	 <0.06 <0.02
BAAQMD Threshold – Cumulative Sources	>100	>0.8	>10.0
Significant?	No	No	No

No stationary sources of TACs, such as generators, are proposed as part of the Project. The Project would introduce new sensitive receptors to the area (although not an air quality impact under CEQA). The effect of the existing or future TAC and PM2.5 sources upon the project was evaluated for informational purposes using methods recommended in the BAAQMD CEQA Guidelines to address community risk impacts.

Community health risk assessments typically look at all substantial sources of TACs that can affect sensitive receptors that are located within 1,000 feet of a project site. These sources include freeways or highways, busy surface streets and stationary sources identified by BAAQMD. Traffic on high volume roadways is a source of TAC emissions that may adversely affect sensitive receptors in close proximity to the roadway. For local roadways, BAAQMD considers roadways with traffic volumes of over 10,000 vehicles per day to have a potentially significant impact on a proposed project. The only potential source of TACs and PM2.5 that would affect the project site is the future extension of Farmers Lane.

The traffic volume on the future Farmers Lane Extension that would run along the eastern boundary of the project is expected to exceed 10,000 vehicles per day. A review of BAAQMD's Google Earth map tool did not identify any stationary sources with the potential to affect the project site. The BAAQMD Roadway Screening Analysis Calculator using the average daily traffic (ADT) on Farmer Lane, estimated to be 14,100 vehicles per day.[1] Using the BAAQMD Roadway Screening Analysis Calculator for Sonoma County for north-south directional roadways and at a distance of approximately 75 feet west of the roadway, estimated cancer risk from Farmer Lane Extension at the nearest on-site receptor would be 2.9 per million and PM2.5 concentration would be 0.11 µg/m3. Chronic or acute Hazard Index for the roadway would be below 0.03. These levels are below the community risk thresholds for sensitive receptors.

Construction activity would generate dust and equipment exhaust on a temporary basis that could affect nearby sensitive receptors. Those potentially substantial concentrations would be reduced to a level of less than significant with implementation of Mitigation Measure AIR-2, listed below

III(d) Less Than Significant Impact. Other Emissions. The Project construction and operation will not generate any permanent source of new odors or subject sensitive receptors to new significant permanent odors. During construction, odors will be generated by construction equipment; these odors will be present only temporarily during construction. Therefore, the Project will result in less than significant impacts under this criterion.

Recommended Mitigation Measures:

[1] *Email from Briana Byrne of W-Trans to Sponamore Associates on February 28, 2017 reporting average daily traffic projections for the Farmers Lane Extension based on the Sonoma County Transportation Authority traffic model and contained in Attachment B.*

Mitigation Measures AQ-1: Dust and exhaust control. During any construction period ground disturbance, the applicant shall ensure that the Project contractor implement measures to control dust and exhaust. Implementation of the City's Standard construction measures along with the measures recommended by BAAQMD, both listed below would reduce the air quality impacts associated with grading and new construction to a less than significant level. The contractor shall implement the following best management practices:

- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
- Post a sign visible from the public right-of-way providing contact information for construction-related complaints. Corrective action shall be implemented within 48 hours. The Air District's phone number shall be posted on the same sign to ensure compliance with applicable regulations.

Implementation of Mitigation Measure AQ-1, which represents Best Management Practices recommended by BAAQMD, and along with the Standard Conditions of Approval, will reduce the potential impact of construction-period fugitive dust, construction emissions and construction TACs, to a less-than-significant level and also reduce construction period emissions.

Mitigation Measure AQ-2: Equipment Selection. The Project shall implement the following plan, demonstrating that the off-road equipment used on-site to construct the Project would achieve a fleet-wide average 69 percent reduction in $PM_{2.5}$ exhaust emissions or greater. To achieve this reduction, the Project shall be required to:

- Document that all mobile diesel-powered off-road equipment larger than 25 horsepower and operating on the site for more than two days continuously shall meet, at a minimum, U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent.
- The construction contractor shall use other measures to minimize construction period DPM emission to reduce the predicted cancer risk below the thresholds including the use of equipment that includes CARB-certified Level 3 Diesel Particulate Filters[1] or alternatively-fueled equipment (i.e., non-diesel) to meet this requirement.
- The contractor shall use added exhaust devices to reduce community risk impacts to less than significant.

As stated in the BAAQMD CEQA Guidelines, implementation of Mitigation Measure AQ-1 will reduce exhaust emissions by 5 percent. Implementation of Mitigation Measure AQ-2 would further reduce on-site diesel exhaust emissions. This effect of implementing this mitigation measure was evaluated using the CalEEMod model to assume best management practices for controlling fugitive dust (i.e., application of Mitigation Measure AQ-1 and the City's standard construction conditions of approval) and use of Tier 2 equipment with Level 3 Diesel Particulate Matter Filters (DPFs). The CalEEMod modeling indicated that mitigated exhaust PM_{10} emissions would be 89 percent lower and the $PM_{2.5}$ emissions would be 84 percent lower. This was assumed to result in a proportional decrease in cancer risk and annual $PM_{2.5}$ concentrations, such that the mitigated risk would be 6.5 in one million and the $PM_{2.5}$ concentration would be less than 0.1 $\mu g/m^3$. The resulting risks and PM2.5 concentrations are below the community risk significance thresholds. After implementation of these mitigation measures, the Project would have a less-than-significant impact with respect to community risk caused by construction activities.

Mitigation Measure 1 would implement BAAQMD-recommended "best management practices" to control fugitive dust emissions during construction that would reduce the impact to a less than significant level

with respect to construction period emissions. Mitigation Measures AQ-1 and AQ-2 would reduce construction period TAC and PM2.5 emissions such that resulting cancer risk and PM2.5 concentrations would not exceed community risk thresholds.

Standard Conditions of Approval:

The Project shall be subject to the following City construction-related conditions:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

Sources:

- BAAQMD Website and Significance Thresholds, 2010, updated 2011
- City of Santa Rosa 2035 General Plan/FEIR, 2009
- City of Santa Rosa Climate Action Plan, adopted June 2012
- Illingworth & Rodkin, Community Risk Assessment (TAC), Penstemon Place, March 8, 2017
- W-Trans, Traffic Impact Study for the Penstemon Place Project, January 2017, updated January 2018

IV. BIOLOGICAL RESOURCES

Would the Project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Discussion:

A complete biological resources assessment has been prepared for the Project site by WRA, Inc. (WRA) in March of 2017. This report and inventory include results of recent site plant and wetland surveys at the Project site and is found in Attachment D-1 and results of a wetlands analysis prepared in 2015 (Attachment D-2). A Tree Inventory & Evaluation was prepared by Becky Duckles in March of 2018 (Attachment D-3), Tree Mitigation Tabulation prepared by Carlile-Macy is found in Attachment D-4.

Biological resources include common plant and animal species, and special-status plants and animals as designated by the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS). The California Native Plant Society (CNPS) data was also referenced. Biological resources also include waters of the United States and State, as

regulated by the U.S. Army Corps of Engineers (USACOE), and the California Regional Water Quality Control Board (RWQCB). The following summarizes the analysis provided in the Biological Resources Analysis in Attachment D.

Plant Communities and Associated Wildlife Habitats

Developed/disturbed portions of the Project Area include previously developed single-family residences around the perimeter of the Project Area. Some residences were vacant, and some were occupied during the time of the site visit. Developed/disturbed areas include the buildings, driveways, backyards and associated landscaping. Dominant vegetation within the developed/disturbed areas consists of a mixture of ornamental and native, presumably planted tree and shrub species including London plane (Platanus x acerifolia), valley oak (Quercus lobata), coast live oak (Q. agrifolia), oleander (Nerium oleander), and juniper (Juniperus sp.). Herbaceous species within this community are predominantly non-native grasses and forbs. This community contains two native tree species, Quercus agrifolia (Coast Live Oak) and Quercus lobata (Valley Oak), large enough to be considered heritage trees per the Santa Rosa Tree Ordinance. In total there are 16 heritage trees within the Project Area. The "Arborist's Report: Tree Inventory and Evaluation" (Duckles, 2018 contained in Attachment D-3) for information regarding tree species, diameter, health, structural integrity, recommendations, and location.

Two sensitive communities are present within the Project Area (seasonal wetland and perennial wetland). Five special-status plant species were determined to have a moderate or high potential to occur within the Project Area. Six special-status wildlife species were determined to have potential to occur within the Project Area and one special-status species is present. In addition, a comprehensive tree survey was conducted by an ISA-Certified Arborist for the Project (Duckles 2017). The project area contains 16 heritage trees, as defined by the City's ordinance. Out of a total of 53 trees in the project area, pursuant to City Code 17-24 (Tree Ordinance), the Project would result in the removal of 26 trees, 13 of which are exempt trees and 13 of which are heritage trees per the City's ordinance. An additional 4 trees, all oaks (three of which are heritage trees), may be removed if construction affects their health. All trees to be removed will require a permit and mitigation per the City's ordinance.

The Project Area does not provide any substantial value as a local wildlife corridor, nor would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species. Wildlife movement between suitable habitat areas can occur via open space areas lacking substantial barriers. The key to a functioning corridor or linkage is that it connects two larger habitat blocks, also referred to as core habitat areas (Beier and Loe 1992, Soule and Terborgh 1999). The term "wildlife corridor" is useful in the context of smaller, local area planning, where wildlife movement may be facilitated by specific local biological habitats or passages and/or may be restricted by barriers to movement. Above all, wildlife corridors must link two areas of core habitat and should not direct wildlife to developed areas or areas that are otherwise void of core habitat (Hilty et al. 2006). Although the Project Area is adjacent to open space to the east, the Project Area is bounded on three sides (north, west and south) by high-density suburban residential development. Therefore, it does not provide a habitat linkage between open space to the east and another habitat block to the west. The Project Area does not function as a wildlife corridor, and no effects to wildlife corridors are anticipated to result from the proposed project.

<u>Wetlands</u>. One contiguous potential seasonal wetland feature, occupying approximately 1.41 acres, was delineated within the Project Area in 2015.

One discrete potential perennial wetland feature, occupying approximately 0.05 acre, was delineated within the Project Area in 2015 (Attachment D-2). The perennial wetland feature is nested within the broader seasonal wetland and located in the southeast quadrant of the Project Area.

Potential impacts to these sensitive resources associated with the proposed conversion of the site from primarily undeveloped land to a 59-lot subdivision of new single-family residential homes are discussed

below. Recommended avoidance, minimization, and mitigation measures to reduce such impacts are also included.

Impacts:

IV(a, b, c, e) Less Than Significant With Mitigation Incorporated.

(a) Potential Impacts to Special-Status Plant Species: Five special-status plant species, fragrant fritillary, congested-headed hayfield tarplant, Harlequin lotus, marsh microseris, and Gairdner's yampah were determined to have a moderate potential to occur within the Project Area. Fragrant fritillary, congested-headed tarplant, and marsh microseris are all California Native Plant Society Rank 1B species, meaning that they are considered rare, threatened or endangered in throughout their range in California, and they must be considered under CEQA. In contrast, Harlequin lotus and Gairdner's yampah both carry a California Native Plant Society Rank 4.2. According to the California Native Plant Society Rank guidelines (CNPS 2016b), few, if any, Rank 4 species are eligible for state listing under California Endangered Species Act; however, impacts may be considered significant under CEQA in special cases. Special cases where a Rank 4 species may be considered significant are described in bullet points below. Examples of impacts that may be considered significant under CEQA include:

- Impacts to the type locality of a California Rare Plant Rank 4 plant;
- Impacts to populations at the periphery of a species' range;
- Impacts in areas where the taxon is especially uncommon;
- Impacts in areas where the taxon has sustained heavy losses; or
- Impacts to populations exhibiting unusual morphology or occurring on unusual substrates.

A protocol survey for fragrant fritillary and harlequin lotus was conducted on March 10, 2017, which was within the typical blooming period for both of these plants, and none were observed. Therefore, these two plants are now considered to not be present. The two remaining plants, because of their later typical blooming period, were surveyed in July with no plants observed. With confirmation that neither species is present, the Project will have no adverse impacts to special-status plant species. All surveys followed the protocols outlined by the relevant resource agencies and included reference site visits to documented occurrences of three of the five target species to confirm that these species were in bloom. By following the protocols and visiting reference sites these surveys were determined to be valid, and are typically considered valid for three years. Moreover, the CNPS protocols state that one botanist can cover approximately 8 acres per hour within moderate diversity grasslands such as exist in the Project Area. A qualified botanist spent more than enough time on site and the survey was floristic in nature (all species observed were identified to the appropriate level to determine rarity). Therefore, the survey results are considered valid

Special-Status and Nesting Bird Species: Six special-status wildlife species were determined to have potential to occur within the Project Area, including: Allen's hummingbird (Selasphorus sasin), oak titmouse (Baeolophus inornatus), fringed myotis (Myotis thysanodes), long-legged myotis (Myotis volans), pallid bat (Antrozous pallidus), Townsend's western big-eared bat (Corynorhinus townsendii townsendii), and Yuma myotis (Myotis yumanensis), and one special-status species, Nuttall's woodpecker (Picoides nuttallii), is present. Additionally, the Project may affect nonspecial-status native nesting birds which are protected by the Migratory Bird Treaty Act and California Fish and Game Code.

The Project may affect nesting by Allen's hummingbird, Nuttall's woodpecker, and non-special-status birds protected by Migratory Bird Treaty Act and California Fish and Game Code (which includes most common non-special status bird species) by modifying nesting habitat, or by causing disturbance of a sufficient level to cause abandonment of an active nest. Potential impacts to these species and their habitats could occur during the removal of vegetation (i.e. tree and shrub removal) and structures (i.e. existing buildings), grading, or ground-disturbing activities. These activities could result in the direct removal or destruction of the active nests of protected bird species. These activities may also create audible, vibratory and/or visual disturbances which cause birds to abandon active nests.

Activities that result in the direct removal of active nests or disturbance to breeding birds sufficient to result in the abandonment of active nests would be potentially significant. Mitigation Measure BIO-3 addresses impacts to nesting birds and details how the mitigations will be implemented. With the implementation of these avoidance and minimization measures, the project will not result in impacts to nesting birds. Any active nests will be avoided by appropriate buffers until nests become inactive. Since no active nests will be disturbed after implementation of this mitigation measure, the Project will be in compliance with the MBTA and CFGC. As described above, the Project is preserving the largest valley oak and coast live oaks which represent the highest quality nesting habitat thereby ensuring that the migration reduces this impact to a level of less than significant.

Special-Status Bat Species: The Project Area contains uninhabited buildings that may provide roost structures to bat species documented in the vicinity and outlined in Attachment D: fringed myotis, long-legged myotis, pallid bat, Townsend's big-eared bat, and Yuma myotis. At the time of the site visit, the building was boarded at typical points of entry. However, bats are known to use buildings' relatively small entry and egress points that the initial site visit did not assess. The planned demolition of these buildings could potentially impact bat species that may use them as a roost. Potential impacts to these species and their roost habitats could occur during the removal of structures. These activities could result in the direct removal or destruction of the maternity roost. These activities may also create audible, vibratory and/or visual disturbances which cause maternity roosting bats to abandon their roost site.

Activities that result in the direct removal of active roosts or disturbance to maternity roosting bats sufficient to result in the abandonment of the roost would be potentially significant. Mitigation Measure BIO-4 addresses impacts to roosting bats by requiring a pre-construction roost assessment survey to determine that there is no evidence of potential for bat roosting activity. If evidence is found, protocols for construction either outside of, or during, the maternity roosting season are identified. With implementation of Mitigation Measure BIO-4 this impact would be less than significant as no roosting bats would be disturbed or removed.

(b and c) Impacts to Seasonal and Perennial Wetlands: The Project Area contains 1.41 acres of seasonal wetland 0.05 acre of perennial wetland which are potentially within the jurisdiction of the Corps under Section 404 of the Clean Water Act and 31 Regional Water Quality Control Board under the Porter Cologne Act and Section 401 of the Clean Water Act. The proposed development will convert all 1.46 acres of wetlands to developed land. Mitigation measures for these impacts are discussed below (see Mitigation Measure BIO-1). With implementation of this mitigation measure impacts to wetlands will be less than significant.

(e) Removal of Heritage Trees: A comprehensive tree survey was conducted by an ISA-Certified Arborist for the Project (Duckles, 2018). Per the City ordinance's criteria, there are 16 heritage trees on the site (mostly Valley Oaks and a few Coast Oaks that exceed 18-inch DBH). Out of a total of 53 trees in the project area, the Project would result in the removal of 26 trees, 13 of which are exempt trees and 13 of which are heritage trees per the City's ordinance. An additional 4 trees, all oaks (three of which are heritage trees), may be removed if construction affects their health. The City of Santa Rosa Tree Ordinance requires that development proposals and subdivision applications preserve and protect heritage trees to the greatest extent feasible. The Project will include retaining walls, large lots, and curb bulb-outs where appropriate to protect seven trees on the site and one tree on an adjacent parcel while satisfying street widening requirements and housing density goals. The Project will preserve the three largest Valley Oaks, all heritage trees with diameters between 30" to 39" DBH. These trees are of good or excellent quality with expansive canopies; they are aesthetically significant to the site and represent the highest quality nesting habitat for wildlife. Four oaks along the project perimeter will be preserved but may decline due to the impact of construction within their root zone. The Project will obtain a tree removal permit from the City prior to the removal of any protected or heritage trees and will mitigate for these removals. As such, this impact would not conflict with local policies or ordinances. Mitigation measures associated with the City's ordinance are summarized below (see Mitigation Measure BIO-2). With implementation of Mitigation Measure BIO-2 this impact would be less than significant. The Arborist's

Report (Duckles, 2018 in Attachment D-3) contains the tree protection measures and the "Tree Mitigation Tabulation," "Replacement Trees Tabulation," and Preliminary Landscape Master Plan (See Figure 3). For information on tree replacement in compliance with the City Code Chapter 17-24, see Table BIO-1, below.

Table BIO-1: Tree Mitigation Summary

Trees to be Removed	Total Diameter to be Removed
All Fruit & Nut Trees	Exempt
All Fruitless Mulberry	Exempt
All Black Acacia	Exempt
All Monterey Pine	Exempt
All Silver Maple	Exempt
Valley Oaks/ Quercus lobata	157"
Coast Live Oaks/ Quercus agrifolia	292"
London Planes/ Platanus x acerifolia)	79"
Hackberry/Celtis sp.	5"
Black Walnut/Juglans nigra	54"
Mexican Pan Palm/Washingtonia Robusta	17"
Total Diameter to be Mitigtated	604"
Total Required Mitigation Trees	201

1. Total required mitigation trees is expressed in number of 15 gallon replacement trees required at the rate of (2) replacement trees for each 6" (or fraction thereof) of trunk caliper (DBH) of trees to be removed per Santa Rosa City Code (Title 17, Chapter 24).
2. See arborist's report dated May 2018 and "Tree Mitigation" dated May 2018 for additional information.
3. Developer shall submit a "Tree Replacement Plan" or pay the appropriate mitigation fee prior to issuance of building permit.

IV(d, f) No Impact.

(d) The Project Area does not provide any substantial value as a local wildlife corridor, nor would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species. No effects to wildlife corridors are anticipated to result from the proposed project.

(f) The Project will not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. Although the Project is within the Santa Rosa Plain geographic area, both the Santa Rosa Plain Conservation Strategy (which has not been fully adopted) and the USFWS Biological Opinion for the Santa Rosa Plain have always indicated that development in the Project Area and vicinity would have no effect on listed plants covered by the documents (WRA 2017). In addition, although the Project Area and vicinity was once considered within the range of CTS, it has been determined in the years since that CTS are unlikely to be present. In 2007, CDFG designated the Project Area and land in the vicinity as a "no effect" area on CTS during development (CDFG 2007). There have been no occurrences of CTS in the Project Area or vicinity east of U.S. Highway 101, ever. Furthermore, the USFWS defined the Project Area and land in the vicinity as "not identified as a core management area" (USFWS 2016). The increased development in this area since the publishing of these two materials are further evidence that CTS are not considered to be in proximity of the Project Area. No breeding, upland, or dispersal habitat is present, and this species is not known within 2 miles of the Project Area (USFWS 2005, CDFG 2007, USFWS 2016, and CDFW 2017). Based on this information, the Project will have no adverse effect on listed plants or CTS and will not be in conflict with the Santa Rosa Plain Conservation Strategy, the Biological Opinion, or any other conservation plan.

Recommended Mitigation Measures:

BIO-1. Wetlands: The wetland delineation report (WRA 2015) shall be submitted to the U.S. Army Corps of Engineers for verification. A permit from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and/or California Department of Fish and Wildlife shall be required to fill the 1.41 acres of seasonal wetland and 0.05 acre of perennial wetland (1.46 acres total) in the Project Area. Impacts to seasonal and perennial wetland features will be fully mitigated at a minimum 1:1 ratio on a functions and values basis ("no net loss"); however, the final wetland mitigation requirements are determined by the regulatory agencies during the permitting process. Required no net loss mitigation ratios shall be met by creating wetlands off-site (may require a higher than 1:1 replacement to impacts ratio, as determined by agencies) or purchasing wetland credits (1:1 ratio) from an established and agency approved wetland mitigation bank. Permits from agencies cannot be authorized until no net loss mitigation is determined to have been fulfilled by the agencies. Ultimate mitigation ratios are determined by the resource agencies (Corps and RWQCB) through the Section 404/401 permitting process. Once applications are submitted, the mitigation requirements are determined, not prior to submitting applications. The resource agencies dictate and approve which mitigation banks the applicant can purchase credits from based on the Project service area and credit availability. Implementation of these compensatory mitigation measures will reduce wetland impacts to less-than-significant levels.

BIO-2. Tree Removal: The City of Santa Rosa Tree Ordinance requires that development proposals and subdivision applications preserve and protect heritage trees to the greatest extent feasible. The Project will preserve the three largest Valley Oaks, all heritage trees with diameters between 30" to 39" DBH. These trees are of good or excellent quality with expansive canopies; they are aesthetically significant to the site and represent the highest quality nesting habitat for wildlife. Four oaks along the project perimeter will be preserved but may decline due to the impact of construction within their root zone. The Project will obtain a tree removal permit from the City prior to the removal of any protected or heritage trees and will mitigate for these removals. As such, this impact would not conflict with local policies or ordinances.

A tree removal permit shall be obtained from the City of Santa Rosa for any alteration, removal or relocation of any tree including heritage, protected or street tree. The City of Santa Rosa requires replacement plantings or financial contributions as a condition of approval in order to mitigate for the loss of functions provided by trees to be removed including shade, erosion control, groundwater replenishment, visual screening, and wildlife habitat. Replacement trees shall be planted in accordance with the following criteria as stated in the City's Ordinance:

a. For each 6 inches or fraction thereof of the diameter of a tree which was approved for removal, two trees of the same genus and species as the removed tree (or another species, if approved by the City), each of a minimum 15-gallon container size, shall be planted on the project site, provided however, that an increased number of smaller size trees of the same genus and species may be planted if approved by the City, or a fewer number of such trees of a larger size if approved by the City.
b. If the development site is inadequate in size to accommodate the replacement trees, the trees shall be planted on public property with the approval of the Director of the City's Recreation and Parks Department. Upon the request of the developer and the approval of the Director, the City may accept an in-lieu payment of $100.00 per 15-gallon replacement tree on condition that all such payments shall be used for tree-related educational projects and/or planting programs of the City.
c. A consulting arborist shall be present during work done within their driplines to assess how many roots are encountered that must be cut. A note stating this will be printed on construction plans to alert the contractors and supervisors to schedule the arborist. If the trees are deemed by the arborist to be unstable or hazardous after that work, they shall be removed and mitigated.
d. Tree protection fencing shall be installed at the outer edge of the protected tree driplines prior to construction, or at the limit of required access on Linwood.

The above mitigation measures along with payment of any required in lieu fees, will provide full mitigation for impacts related to the removal of trees, reducing the impact to less than significant.

BIO-3. Nesting Birds: The following mitigation measures shall be implemented to avoid impacts to Allen's hummingbird, Nuttall's woodpecker, and nesting birds protected by the Migratory Bird Treaty Act and California Fish and Game Code.

a. If ground disturbance or vegetation removal is initiated in the non-breeding season (September 1 through January 31), no pre-construction surveys for nesting birds are required and no adverse impact to birds would result.
b. If ground disturbance or removal of vegetation occurs in the breeding bird season (February 1 through August 31), pre-construction surveys following guidelines/protocols by CDFW shall be performed by a qualified biologist, including conducting the surveys no more than 14 days prior to commencement of such activities to determine the presence and location of nesting bird species. If active nests are present, standard nesting bird avoidance measures following CDFW guidelines will be implemented, including establishment of temporary no-work buffers around active nests will prevent adverse impacts to nesting birds. Appropriate buffer distance shall be determined by a qualified biologist and is dependent on species, surrounding vegetation, and topography. Once active nests become inactive, such as when young fledge the nest or the nest is subject to predation, work may continue in the buffer area and no adverse impact to birds will result.

With the implementation of these avoidance and minimization measures, the project will not result in impacts to nesting birds. Any active nests will be avoided by appropriate buffers until nests become inactive. Since no active nests will be disturbed, the Project will be in compliance with the MBTA and CFGC. As described above the Project is preserving the largest valley oak and coast live oaks which represent the highest quality nesting habitat. Therefore, the impact is considered less than significant.

BIO-4. Special-Status Bat: The following measures shall be implemented to avoid impacts to special-status bat species:

a. Pre-construction roost assessment survey: A qualified biologist shall conduct a roost assessment survey of uninhabited residences located within the Project Area at least one week prior to initiation of construction. The survey will assess use of the structure for roosting as well as potential presence of bats. If the biologist finds no evidence of, or potential to support bat roosting, no further measures are recommended. If evidence of bat roosting is present, additional measures described below shall be implemented:
    1. Work activities outside the maternity roosting season: If evidence of bat roosting is discovered during the pre-construction roost assessment and demolition is planned August 1 through mid-April (outside the bat maternity roosting season), a qualified biologist shall implement passive exclusion measures (i.e. sealing up points of ingress/egress) to prevent bats from re-entering the structures, or making the structures unsuitable to roosting (i.e. opening up the structures to excessive wind or light exposure which would limit temperature stability necessary for thermoregulation during roosting). After sufficient time to allow bats to escape and a follow-up survey to determine if bats have vacated the roost, demolition may continue and impacts to special-status bat species will be avoided.
    2. Work activities during the maternity roosting season: If a pre-construction roost assessment discovers evidence of bat roosting in the uninhabited residences during the maternity roosting season (March 1 through July 31), and determines maternity roosting bats are present, demolition of maternity roost structures shall be avoided during the maternity roosting season or until a qualified biologist determines the roost has been vacated.

With the implementation of the above Mitigation Measures, the Project will not result in impacts to special-status bat species or bat maternity roosts. Therefore, the impacts to special-status bats will be less-than-significant levels.

Sources:

- Duckles, B. ISA, Arborist's Report, Tree Inventory & Evaluation, Penstemon Place, May 2018
- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- WRA, Inc., Biological Resources Assessments, Penstemon Place Development Project, March 2017, letter dated June 6, 2017, and letter dated July 25, 2017
- WRA, Inc., Draft Jurisdictional Wetlands Delineation Report, McIntosh Property, April 2015

V. CULTURAL RESOURCES

Would the project?	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Cause a substantial adverse change in the significance of a historic resource as defined in 15064.5?	☐	☐	☒	☐
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to 15064.5?	☐	☐	☒	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

Discussion:

A Cultural Resources Report evaluating the Project site was prepared by Tom Origer & Associates in October of 2015. Their report serves as the basis of this analysis and conclusions. The full report is found in Attachment J.

The Project site is located on an underdeveloped site within the City of Santa Rosa within an area of planned development. The study area comprises approximately 9.7 acres of gradually sloping land located less than two miles southeast of downtown Santa Rosa, as shown on the Santa Rosa, California 7.5' USGS topographic maps.

Based on the distribution of known cultural resources and their environmental settings, it was anticipated that prehistoric and/or historical archaeological sites could be found within the study area. One isolated flake made from obsidian of the Annadel source was found near a tree in the northwest portion of the study area. The specimen found was a single isolated obsidian flake. Isolated finds can contribute some information to prehistoric land use and hunting patterns. However, once their presence is documented no further work is warranted. The isolated find has been documented and no further investigation or protection is warranted.

V(a) **Less Than Significant Impact. Historic.** Six homes are located within the study area. ParcelQuest.com indicates that these homes were constructed during the 1960s. Five of the six homes have nearly identical footprints. All 6 houses are modest, ranch-style homes, and they are in various states of disrepair; only four are currently habitable.

While the residences on the property meet the age guidelines for consideration to the California Register of Historical Resources, none of the homes are architecturally distinctive or representative of a historical period. ParcelQuest.com indicates that the buildings were constructed during the 1960s; therefore, their potential to yield important information is limited by their relative youth. None of the buildings meet Criterion 1 of the California Register because there is no evidence to suggest that any of the buildings have made a significant contribution to local or regional history, or the cultural heritage of California or the United States. None of the buildings meet Criterion 2 of the California Register because there is no evidence to suggest that they are associated with the lives of persons important to local, California, or national history. Based on the age of the buildings, it is unlikely that they have been associated with the lives of persons important to local, California, or national history. None of the buildings meet Criterion 3 of the California Register because none of the buildings have any distinctive architectural characteristics.

They are all modest, ranch-style homes. The Ranch-style is ubiquitous to mid-20th century developments within Sonoma County and is considered to be relatively commonplace. None of the buildings meet Criterion 4 because they do not have the potential to yield information important to the prehistory or history of the local area, California, or the nation. Therefore, in the opinion of Tom Origer Associates, these six buildings do not appear to meet eligibility criteria for inclusion on the California Register of Historical Resources. No further work is recommended and razing these homes will result in a less than significant impact.

V(b,c) **Less Than Significant Impact. Archaeological.** Contacts to Native American groups[2], archival research and a field survey did not reveal any prehistoric or historic-era cultural resources within the study area, and no resource-specific recommendations are warranted.

There is the possibility that buried archaeological deposits could be present, and accidental discovery could occur. In keeping with the CEQA guidelines, if archaeological remains are uncovered, work at the place of discovery should be halted immediately until a qualified archaeologist can evaluate the finds (§15064.5 [f]). Prehistoric archaeological site indicators include: obsidian and chert flakes and chipped stone tools; grinding and mashing implements (e.g., slabs and handstones, and mortars and pestles); bedrock outcrops and boulders with mortar cups; and locally darkened midden soils. Midden soils may contain a combination of any of the previously listed items with the possible addition of bone and shell remains, and fire affected stones. Historic period site indicators generally include: fragments of glass, ceramic, and metal objects; milled and split lumber; and structure and feature remains such as building foundations and discrete trash deposits (e.g., wells, privy pits, dumps).

V(c) **Less than Significant Impact. Human Resources.** No resources were identified in archival research, during contacts or during the on-site field reconnaissance. Existing standard measures, imposed by the City of Santa Rosa and promulgated in Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5 pertaining to the discovery of human remains, will protect any subsurface human remains that might be discovered during construction. As such, impacts will be less than significant.

Mitigation Measures:

None required

Standard Measures:

The City's standard construction related measures require that if any cultural resources, such as structural features, unusual amounts of bone or shell, artifacts, human remains, or architectural remains are encountered during any construction activities, the Contractor shall implement measures deemed necessary and feasible to avoid or minimize significant effects to the cultural resources including the following:

- Suspend work within 100 feet of the find; and,
- Immediately notify the City's Community Development Director and coordinate any necessary investigation of the site with a qualified archaeologist as needed to assess the resources (i.e., whether it is a "historical resource" or a "unique archaeological resource"); and,
- Provide management recommendations should potential impacts to the resources be found to be significant;
    - Possible management recommendations for historical or unique archaeological resources could include resource avoidance or data recovery excavations, where avoidance is infeasible in light of project design or layout, or is unnecessary to avoid significant effects

[2] Preliminary notification letters sent by the consulting archaeologist will be followed by formal consultation by the City's under its obligation to consult under AB52. Letters sent by the consulting archaeologist do not have specific comment period; however, the majority of the letters were sent October 1, 2015 allowing 20 days for the tribes to respond. No responses were received during that period, except from the NAHC, as noted.

- In addition, the Contractor in consultation with the Preservation Director, State Historic Preservation Officer, and if applicable, Tribal representatives, may include preparation of reports for resources identified as potentially eligible for listing in the California Register of Historical Resources.

None of the responses received from the tribes indicated that they desire an archaeologist present during initial grading.

The following actions are promulgated in Public Resources Code 5097.98 and Health and Human Safety Code 7050.5, and pertain to the discovery of human remains:

- If human remains are encountered, excavation or disturbance of the location must be halted in the vicinity of the find, and the county coroner contacted. If the coroner determines the remains are Native American, the coroner will contact the Native American Heritage Commission. The Native American Heritage Commission will identify the person or persons believed to be most likely descended from the deceased Native American. The most likely descendent makes recommendations regarding the treatment of the remains with appropriate dignity.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Tom Origer & Associates, Cultural Resources Study, October 2015

VI. ENERGY

Would the project?	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Result in a potentially significant environmental; impact due to wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operation??	☐	☐	☒	☐
b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☒	☐

Discussion

Most of the energy consumed in Santa Rosa is produced from traditional sources and delivered to the city through established distribution networks. Pacific Gas and Electric Company (PG&E) provides electrical services and natural gas within the Urban Growth Boundary, and gasoline and other petroleum products are sold through private retailers throughout the city. City of Santa Rosa adopted an all-electric “reach code” (Ord. 2019-019). Natural gas connections and appliances for new dwelling units are not allowed for building permit applications submitted after January 1, 2020.

New buildings, including homes, constructed in California must comply with the standards contained in Title 20, Public Utilities and Energy, and Title 24, Building Standards Code, of the California Code of Regulations (CCR). These efficiency standards apply to new construction of both residential and nonresidential buildings, and both 20 CCR and 24 CCR regulate energy consumed for heating, cooling, ventilation, water heating, and lighting. The building efficiency standards are enforced through the local building permit process.

The 2019 update to the Building Energy Efficiency Standards focuses on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the residential Standards include improvements for attics, walls, water heating, and lighting. Installation of photovoltaic systems is now mandatory for new dwelling units.

In 2010, the City adopted CALGreen Tier 1 standards which apply to all new buildings and to additions and alterations of residential and non-residential buildings. The Tier 1 standards exceed the basic level of requirements of the CALGreen Building Code. This program supports the City’s efforts to reduce greenhouse gases to reach the local, regional, and state targets outlined in the City’s Climate Action Plan. The City adopted CAP in 2012 and a Municipal Climate Action Plan (MCAP) in 2013. The CAP examines community-wide sources of GHG emissions and outlines strategies for reducing these emissions. The MCAP addresses greenhouse gas emissions from the City’s municipal operations. In 2019, the City adopted the all-electric reach code. CALGreen Tier 1 was adopted except for the energy code section.

The City of Santa Rosa General Plan addresses energy use and efficiency in all elements by including goals and policies for improving energy efficiency and reducing waste. The General Plan seeks to reduce energy consumption through minimizing vehicle trips and approving land use patterns that support increased density in areas where there is infrastructure to support it, increased opportunities for transit, pedestrians, and bicycles, and through green building and land development conservation strategies.

Impacts

VI(a,b) **Less than Significant Impact. Energy**. Project construction will occur for approximately 15 months and will consume energy through the operation of heavy off-road equipment, trucks, and worker

vehicle traffic. Electricity will be used to power tools, lighting, and electric machinery. Operation of the 59 residences will consume electricity, water, and natural gas. Electricity and natural gas will be used for lighting, heating, and appliances. However, the Project's 59 new homes will replace 6 older, less energy efficient homes with energy efficient buildings.

The Project will be required to comply with the applicable measures identified in the CAP *New Construction Checklist* including policies related to energy efficiency as a standard condition of approval. Details on CAP compliance for construction and operation of the Project are provided in Section VII Greenhouse Gases. Compliance with the City of Santa Rosa CAP, including but not limited to compliance with the City's CalGreen Tier 1 Standards and California Energy requirements under Title 24 and installation of real-time energy monitors will ensure the Project will not result in wasteful, inefficient, or unnecessary consumption of energy during construction and operation of the Project.

The Project must comply with California requirements under Title 20 and Title 24 will require the Project to comply with state building energy requirements. These requirements are enforced during the City's permit approval and will reduce impacts on wasteful, inefficient, or unnecessary consumption of energy during operation of the Project. Therefore, impacts related to wasteful, unnecessary energy consumption and compliance with renewable or energy efficiency plans will be less than significant.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/FEIR, 2009
- City of Santa Rosa Climate Action Plan, adopted 2012
- City of Santa Rosa Municipal Climate Action Plan, adopted 2013

VII. GEOLOGY AND SOILS

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐		☐
iii) Seismic related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on, or off, site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f. Directly or indirectly destroy a unique paleontological resource or site or unique geological features?	☐	☐	☒	☐

Discussion:

The Project has been the subject of a geotechnical investigation prepared by RGH Consultants in November of 2015. Their report is the basis for this analysis and the conclusions. The entire report is found in Attachment F.

As described by RGH Consultants, the property extends primarily over level to moderately sloping terrain. The vegetation consists primarily of annual grasses and scattered oak trees. Published geologic maps indicate the property is underlain by three geologic units. The western and southern portion of the site is underlain by the Pliocene and Miocene age Petaluma Formation, which is comprised of sandy to silty gravel, silty sandstone, siltstone, and mudstone. The central and northern portion of the site is underlain by Holocene age alluvium which is comprised of gravel, sand, and silt. The eastern portion of the site is

underlain by an andesite, basaltic andesite and basalt unit of the Pliocene and Miocene age Sonoma Volcanics group. The Project site does not contain evidence of any geologic activities such as faulting and landsliding, but is located in an area considered to be susceptible to ground motions.

Santa Rosa is located within a seismically active area in California. The area is subject to geological hazards related primarily to seismic events (earthshaking) due to presence of faults. The branches of the Rodgers Creek fault zone have not been historically active, but there is evidence of activity within the last 11,000 years. The Rodgers Creek fault traverses the eastern portion of Santa Rosa. There is the potential for geologic hazards in and around the City associated with ground shaking, including liquefaction, ground failure, and seismically induced landslides. Initial Study/Mitigated Negative Declaration 39 Park Lane II Apartments - Santa Rosa a major seismic event on one of the active faults near the City of Santa Rosa could result in violent to moderate ground shaking. Strong ground shaking would be expected from earthquakes generated by nearby faults including the Rodgers Creek Fault (4 miles East), Mayacama fault (15 miles North), San Andreas Fault (14 miles Southwest), and the West Napa fault (30 miles Southeast).However, the Project site is not located within the Alquist-Priolo Special Study Zone, as depicted in the General Plan 2035 (Figure 12-3). In addition, the site is outside of the area of violent ground shaking in the event of an earthquake on the Rogers Creek Fault. The development shall be required to be in compliance with the California Building Code (CBC) to address all potential impacts related to possible area seismic activity, reducing impacts from geologic hazards less than significant.

Free groundwater was not observed in test pits at the time of excavation. On hillsides, rainwater typically percolates through the porous surface materials and migrates downslope in the form of seepage at the interface of the surface materials and bedrock, and through fractures in the bedrock. Fluctuations in the seepage rates typically occur due to variations in rainfall intensity, duration and other factors such as periodic irrigation.

While the primary geologic hazard identified at the site is the potential for strong to very strong earthquake-induced ground shaking. Other hazards, as discussed below, are not considered significant at the site. A brief description of each geologic hazard an assessment of potential impacts as a result of the development of this site is presented in the following paragraphs.

As required by SUSMP, the Project Civil Engineer shall design the site drainage to collect surface water into storm drain systems and discharge water at appropriate locations. Re-establishing vegetation on disturbed areas will minimize erosion. Erosion control measures during and after construction shall conform to the most recent version of the Erosion and Sediment Control Field Manual prepared by the California Regional Water Quality Control Board.

VII(a)(i) **Less Than Significant Impact Fault Surface Rupture.** No landforms within the area exist that would indicate the presence of active faults and the site is not within a current Alquist-Priolo Earthquake Fault Zone Map. Therefore, the risk of fault rupture at the site is low. And thus, not significant

Structures and foundations shall be designed to account for some post-earthquake differential settlement. Foundation design criteria are provided in the Geotechnical Investigation. Compliance with the most current seismic design criteria of the CBC will address issues related to seismic instability.

VII(a)(ii) **Less than Significant Seismic Shaking.** The City of Santa Rosa, including the project site, is located in close proximity to the Rodgers Creek fault. This fault has a maximum intensity of X on the Mercalli Intensity Shaking Severity scale, which is a measurement of earthquake intensity indicating moderate to significant structural damage. The San Andreas Fault has a maximum intensity of X as well. The project site is located within areas susceptible to violent and/or very violent ground shaking during an earthquake on the Rodgers Creek fault, as delineated in Figure 12-3 of the Santa Rosa General Plan 2035. Therefore, development of the project site has the potential to expose people or structures to potentially substantial adverse effects resulting from strong seismic ground shaking.

The Project shall be designed per the current edition of the California Building Code at the time of the building permit application in order to ensure design and construction of the proposed subdivision is in strict adherence with current standards for earthquake-resistant construction. Compliance with the building code shall ensure that risks related to seismic shaking are reduced to levels of less than significant.

VII(a)(iii) **Less Than Significant Impact. Ground Failure.** No subsurface conditions were observed that would suggest the presence of materials that may be susceptible to seismically induced densification or liquefaction. Therefore, the potential for the occurrence of these phenomena at the site is low and therefore deemed a less than significant impact.

VII(a)(iv) **Less Than Significant Impact. Landsliding.** No indications of large-scale slope instability or landslides were discovered at the site and, therefore, are deemed a less than significant impact.

VII(b) **Less Than Significant Impact. Erosion.** Expansive soils were encountered along the western portion of the site and a portion of the southeastern part of the site. Expansive surface soils shrink and swell as they lose and gain moisture throughout the yearly weather cycle. Near the surface, the resulting movements can heave and crack lightly loaded shallow foundations (spread footings) and slabs. Prior to issuance of a grading permit, an erosion control plan along with grading and drainage plans shall be submitted to the Building Division of the City's Department of Planning and Economic Development. All earthwork, grading, trenching, backfilling, and compaction operations shall be conducted in accordance with the City of Santa Rosa's Grading and Erosion Control Ordinance, Chapter 19-64 of the Santa Rosa Municipal Code.

VII(c)**Less than Significant Impact.**

Seismic Induced Ground Settlement. Subsurface conditions encountered during testing did not suggest the presence of materials that may be susceptible to seismically induces densification or liquefaction. Therefore the potential occurrence of this phenomenon at the site is low and therefore a less than significant impact.

Lateral Spreading, Lurching and Ground Cracking. Provided the foundations are installed as recommended herein, and the proposed fills are adequately keyed into underlying bedrock material as subsequently discussed, we judge the potential for impact to the proposed improvements from the occurrence of this phenomenon at the site is low and, therefore, a less than significant impact.

Slope Instability. There are no mapped landslides at the site and landslides were not observed during geotechnical exploration of the site. Therefore the risk of landsliding is considered a less tan significant impact.

Settlement/Subsidence. Significant settlement can occur when new loads are placed at sites due to consolidation of soft compressible clays (i.e. bay mud) or compression of loose soils. Soft compressible materials were not observed during the subsurface exploration that would have a significant potential for compression settlement and consolidation with an applied surface load and is therefore considered a less than significant impact.

VII(d) **Less Than Significant: Expansive Soil.** Expansive soils were encountered along the western portion of the site and a portion of the southeastern part of the site. Expansive surface soils shrink and swell as they lose and gain moisture throughout the yearly weather cycle. Near the surface, the resulting movements can heave and crack lightly loaded shallow foundations (spread footings) and slabs. The zone of significant moisture variation is dependent on the expansion potential of the soil and the extent of the dry season. In the Project area, the active layer is generally considered to range in thickness from about 2 to 3 feet. Stable foundation support needs to be obtained below this layer. If foundations are designed and constructed in accordance with the Geotechnical study and per the current edition of the California Building Code, the risk posed by expansive soils is considered a less than significant impact.

VII(e) The Project proposes to connect to the public sewer system. Therefore, no impacts related to soil capability for wastewater disposal are anticipated.

VIII(f) **Less than Significant Impact.** There are no known unique geological or paleontological features on the Project site that would indicate the presence of cultural resources. However, the potential exists for archaeological resources to be uncovered during construction. The City's standard measures (provided in Section V) will reduce this potential impact to a level of less than significant.

Mitigation Measures:

None required.

Standard Measures:

Grading: Prior to issuance of a grading permit an erosion control plan along with grading and drainage plans shall be submitted to the Building Division of the City's Department of Planning and Economic Development. All earthwork, grading, trenching, backfilling, and compaction operations shall be conducted in accordance with the City of Santa Rosa's Grading and Erosion Control Ordinance, Chapter 19-64 of the Santa Rosa Municipal Code). These plans shall detail erosion control measures such as site watering, sediment capture, equipment staging and laydown pad, and other erosion control measures to be implemented during construction activity on the project site.

All applicable recommendations in the Geotechnical Engineering Investigation and contained in Attachment F are prepared for the subject property, including, but not limited to grading, excavation, foundations systems, and compaction specification shall be incorporated as conditions of project approval. Final grading plan, construction plans, and building plans submitted by the Applicant shall demonstrate that recommendations set forth in the geotechnical reports have been incorporated into the design of the project.

Sources:

- City of Santa Rosa 2035 General Plan/FEIR, 2009
- RGH Consultants, Geotechnical Study Report, McIntosh Property Subdivision, Linwood Avenue, Santa Rosa California, November 2015

VIII. GREENHOUSE GAS EMISSIONS

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Generate Greenhouse Gas Emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b. Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Discussion:

Gases that trap heat in the atmosphere, GHGs, regulate the earth's temperature. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate. The most common GHGs are carbon dioxide (CO_2) and water vapor but there are also several others, most importantly methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). These are released into the earth's atmosphere through a variety of natural processes and human activities. Sources of local GHGs are generally as follows:

- Fossil fuel combustion
- Agricultural operations
- Chlorofluorocarbons
- HFCs

In GHG emission inventories, the weight of each gas is multiplied by its GWP and is measured in units of CO_2 equivalents (CO_2e).

Significance Thresholds

State of California

The State of California has set GHG reduction goals through the passage of Assembly Bill 32 (AB 32), the "Global Warming Solutions Act." AB 32 aims at reducing GHG emissions to 1990 levels by 2020. The BAAQMD CEQA Air Quality Guidelines (Guidelines) have established GHG thresholds of significance in order to meet the goals of AB 32. The BAAQMD Guidelines (updated in 2011) summarizes the GHG thresholds for residential development operational use at 56 units or 1,100 metric tons (mt) of CO2e/year or compliances with an adopted Climate Action Plan.

City of Santa Rosa

On December 4, 2001 the Santa Rosa City Council adopted a resolution to become a member of Cities for Climate Protection (CCP), a project of the International Council on Local Environmental Initiatives (now called ICLEI Local Governments for Sustainability). Since that time all eight Sonoma County municipalities and Sonoma County have become members. By becoming a member, local governments commit to completing five milestones: 1) conduct a GHG emissions analysis; 2) set a target for emissions reduction; 3) draft a local action plan for meeting the target; 4) implement the action plan; and 5) monitor and report on the progress. The City adopted the Climate Action Plan in 2012. A project that is in

compliance with a Qualified GHG Reduction Strategy (such as the City of Santa Rosa's Climate Action Plan) would be considered as having a less than significant impact.

Operation & Construction Discussion: The BAAQMD has established screening criteria to provide lead agencies with a conservative indication of whether a project could result in significant GHG impacts during operations (i.e., occupancy). The operational screening criterion for GHG for single family residential uses is 56 units. This Project proposes new 59 homes, replacing six existing homes, and is therefore below the screening criteria.

Santa Rosa Climate Action Plan (CAP): The Project has included as part of its Project description compliance with the City's Climate Action Plan's measures to reduce the Project's contribution of GHG's. By design, the Project proposes to include solar pre-plumbing and solar on each house and includes all Title 24 and CalGreen Tier 1 Standards in effect at the time of building permit submission. Compliance with these measures is discussed below.

Policy 1.1.1 - Comply with CALGreen Tier 1 Standards: The Project is designed to comply with State Energy requirements for Title 24 and CALGreen Tier 1 Standards in effect at time of building permit submission. Such standards have been incorporated into building placement, site development, building design and landscaping.

Policy 1.1.3 – If after 2020, all new development will utilize zero net electricity: Climate Action Plan (CAP) Goal 1 – 1.1.3 was adopted to coincide with California Energy Codes. Since the CAP adoption, the California Energy Commission (CEC) has determined that it is not possible to achieve "net zero" on a wholesale basis and "net zero" has been removed from the California Energy Codes. Appendix E of Santa Rosa's Climate Action Plan states that, "To be in compliance with the CAP, all measures denoted with an asterisk are required in all new development projects unless otherwise specified. If a project cannot meet one or more of the mandatory requirements, substitutions may be made from other measures listed at the discretion of the Community Development Director." CAP Goal 1 - 1.1 requires projects to comply with Tier 1 CALGreen requirements, as amended, for new non-residential and residential development. Tier 1 CALGreen does not include "net zero" Greenhouse Gas (GHG) assumptions for development. In addition, current California Green Building Code Standards apply to all projects and has been determined by the Director to be an acceptable substitution for CAP Goal 1 – 1.1.3. Therefore, strict compliance with CAP Goal 1 – 1.1.3 is not achievable and not required.

Policy 1.3.1 – Real time Energy Monitors: The Project will include the latest generation of energy monitors to track energy use (i.e. use of nest thermostats).

Policy 1.4.2- Comply with the City's Tree Preservation Ordinance (Santa Rosa Code Section 17-24.020. Out of a total of 53 trees in the project area, there are 26 trees being removed, 13 of which are exempt trees and 13 of which are heritage trees per the City's ordinance. An additional 4 trees, all oaks (3 of which are heritage trees) may be removed if construction affects their health; these trees have been included in the mitigation calculation in the event that they are removed. Hundreds of trees will be planted and/or in-lieu fees paid (in compliance with the City of Santa Rosa Tree Ordinance, City Code Chapter 17-24).

Policy 1.4.3 – Provide public and private trees in compliance with the Zoning Code: As shown on the Landscape Plan, the Project includes the planting of trees, both public and private. The Landscape design is in compliance with the Santa Rosa Zoning Code, Santa Rosa Design Guidelines, and Water Efficient Landscape Ordinance.

Policy 1.5 – Install new sidewalks and paving with high solar reflectivity materials: All proposed new sidewalks, driveways and parking areas will be paved with hard materials that contain either color or other enhancements to provide enhanced reflectivity.

Policy 2.1.3 – Pre-plumb for solar thermal or PV systems: The Project will include pre-plumbing for solar and solar thermal as required by the California Building Code (CBC).

Policy 3.1.2 – Supports implementation of station plans and corridor plans: The Project is not within a Station Area Plan or within a Corridor Plan. The Project does support alternative modes of transit by providing sidewalks and a bike path which encourage a walkable community. The Project is located within walking distance to local parks and open space.

Policy 3.2.1 – Provide on-site services such as ATMs or dry cleaning to site users: The Project has no on-site commercial facilities to house ATMs, dry cleaning services, or similar uses, and is not zoned for such uses.

Policy 3.2.2 - Improve non-vehicular network to promote walking, biking**:** The Project is designed with sidewalks and a bike path to promote walking and biking throughout the subdivision. Sidewalks and bike paths will be provided adjacent to the subdivision so as to connect with the community.

Policy 3.2.3 - Support mixed use, higher density development near services**:** The Project is located in an area designated as Low Density residential on the General Plan Land Use Diagram which is intended for detached single-family homes at a density of 2-8 units per acre. The Project will provide a diversity of housing styles by incorporating access off auto-court and by the inclusion of accessory dwelling units.

Policy 3.3.1 – Provide affordable housing near transit: The Project is located ½ mile away from a public transit (bus stop), therefore this policy does not apply.

Policy 3.5.1 – Unbundle parking from property cost: The property has only private parking and on-site street parking, therefore, the policy does not apply.

Policy 3.6.1 – Install calming features to improve ped/bike experience: The interior Project landscaping is designed to promote and improve both the pedestrian and bicycle experience by providing connectivity to neighborhoods to the north and south.

Policy 4.1.1 – Implement the Bicycle & Pedestrian Master Plan: The Project includes construction of bike lanes and sidewalks along its frontage thereby supporting the City's Bicycle & Pedestrian Master Plan.

Policy 4.1.2 – Install bicycle parking consistent with regulations: There are no regulations that require formalized bicycle parking in single family residential areas, however, the Project provides garages that will be available to house bicycles.

Policy 4.1.3 – Provide bicycle safety training to residents and employees: The Project will sell individual homes; therefore, this policy does not apply.

Policy 4.2.2 – Provide safe spaces to wait for bus arrival: This policy does not apply as there are no bus routes near the site (located ½ mile away).

Policy 4.3.2 – Provide parking for car sharing operations: As a single-family residential development, the owners will have opportunities to develop car sharing options with neighbors.

Policy 4.3.4 – Work with large employers to provide rideshare programs: This policy does not apply to single family residential subdivisions.

Policy 4.3.5 – Consider expanding employee programs promoting transit use: This policy does not apply to single family residential subdivisions as there are no employers at the Project.

Policy 4.3.6 – Provide awards for employee use of alternative commute options: This policy does not apply to single family residential subdivisions as there are no large employers at the Project.

Policy 4.3.7 – Require new employers of 50+ provide subsidized transit passes: This policy does not apply to single family residential subdivisions as there are no large employers at the Project.

Policy 4.3.9 – Provide space for additional Park-and-Ride lots: The Project is a walkable low-density single-family residential subdivision with no space for a park and ride lot.

Policy 4.5.1 – Install facilities for residents that promote telecommuting: All houses will have internet access available.

Policy 5.1.2 – Install electric vehicle charging equipment: All units will have electric charging equipment in the garages that can be used to charge vehicles.

Policy 5.2.1 – Provide alternative fuels at new re-fueling stations: The Project is not a re-fueling station project therefore, this policy does not apply.

Policy 6.1.4 – Increase diversion of construction waste: A Construction Waste Management Plan for recycling and disposal of construction wastes will be provided at time of building permit submittal. The contractor will divert all possible construction waste.

Policy 7.1.1 – Reduce potable water for outdoor landscaping: As shown on the plan, Project landscaping will utilize low water use plants. Landscape irrigation utilizes drip systems using a smart controller. The Project will be compliant with the City of Santa Rosa's WELO.

Policy 7.1.3 – Install Real time water meters: Irrigation system design and real time metering will be shown on final landscaping and irrigation plans. The City provides the water meters and has data logging equipment that can collect real time data from City-issued water meters.

Policy 7.3.2 - Install dual plumbing in areas of future recycled water: Dual plumbing is not proposed as there is no current plan by the City to extend recycled water to this portion of the City. Compliance with Policies 7.1.1, 7.1.3 and 9.1.3 will substitute for this policy.

Policy 8.1.3 – Establish community gardens and urban farms: The Project is a single-family residential development. Each home site has a backyard area that can be used for a garden.

Policy 9.1.2 – Provide outdoor outlets for charging lawn equipment: The Project will have outdoor outlets to allow for accessible charging locations.

Policy 9.1.3 – Install low water use landscapes: Low water use plants will be used to landscape the site. Plant materials and locations are shown on the Project landscape plans. The Project will be compliant with the City of Santa Rosa's WELO.

Policy 9.2.1 – Minimize construction equipment idling time to 5 minutes or less: The developer will condition contractor agreements to limit construction equipment idling time to 5 minutes or less, consistent with the City's Standard Measures for Air Quality. This direction will be included under the heading of General Notes on plan sets submitted for building or grading permits.

Policy 9.2.2 – Maintain construction equipment per manufacturer's specifications: The developer will condition contractor agreements to require that all equipment used at the site be maintained in accordance with the manufacturer's instructions.

Policy 9.2.3 – Limit Green House Gas (GHG) construction equipment by using electrified equipment or alternate fuel: The developer will include provisions in contractor agreements encouraging the use of electrified equipment or equipment using alternative fuels.

General Plan Consistency: The Project's consistency with the City's General Plan energy conservation and design policies is discussed below.

Land Use and Livability

LUL-A Foster a compact rather than a scattered development pattern in order to reduce travel, energy, land, and materials consumption while promoting greenhouse gas emission reductions citywide.

LUL-E Promote livable neighborhoods by requiring compliance with green building programs to ensure that new construction meets high standards of energy efficiency and sustainable material use. Ensure that everyday shopping, park and recreation facilities, and schools are within easy walking distance of most residents.

LUL-E-2 As part of planning and development review activities, ensure that projects, subdivisions, and neighborhoods are designed to foster livability.

Utilize the city's Design Guidelines as a reference when evaluating the following neighborhood components:

- Streets. Street design, traffic calming, and landscaping can make great contributions to the creation of successful neighborhoods. Neighborhood streets should be quiet, safe, and accommodate pedestrians and bicyclists.
- Connections. Neighborhoods should be well connected to local shops and services, public plazas and gathering places, park lands, downtown, schools, and recreation by adequate and safe streets, bike lanes, public pathways, trails, general infrastructure (e.g., sidewalks and crosswalks), and transit.
- Neighborhood Character. Each neighborhood should maintain a distinct identity, such as the historic preservation districts featuring Victorian cottages and California bungalows.
- Diversity and Choice. Neighborhoods should provide choices for residents with different values. Different housing types and locations within the city accommodate a diverse range of needs.

H-G-2 Require, as allowed by Cal Green Tier One standards, energy efficiency through site planning and building design by assisting residential developers in identifying energy conservation and efficiency measures appropriate to the Santa Rosa area. Utilize the following possible techniques:

- Use of site daylight;
- Solar orientation;
- Cool roofs and pavement;
- Window design and insulation;
- Solar water heaters;
- Solar heating of swimming pools;
- Use of sustainable practices and materials;
- Use of building materials which use fewer resources (water, electricity);
- Energy and water use reductions;
- Use of trees for summertime shading; and
- Bicycle and pedestrian connections.

H-G-3 Promote energy efficiency in the provision and use of water in all residential developments.

H-G-5 Continue to require the use of fuel efficient heating and cooling equipment and other appliances, in accordance with the city's green building program.

T-J Provide attractive and safe streets for pedestrians and bicyclists.

UD-A-12 Promote green building design and low impact development projects.

The Project is located within an area designated by the General Plan as Low Density Residential, which allows residential development at a density of 2-8 units per acre. The Project is proposed at a density of 6.08, and implements the above noted land use and livability policies. The Project site is close to schools and Dauenhauer Park, and is easily accessible to public transit (although the nearest stop is ½ mile away). The Project includes traffic calming measures such as sidewalks, and crosswalks to access nearby parks. The Project maintains a neighborhood identity with its home designs (see Section I. Aesthetics for description of the Project's characteristics).

The Project includes green technologies and design components for energy efficiency and water conservation, such as energy efficient heating, cooling, and lighting, efficient roofs, water efficient toilets, low water use landscapes and water meters.

OSC-J-1 Review all new construction projects and require dust abatement actions as contained in the CEQA Handbook of the Bay Area Air Quality Management District.

OSC-K-1 Promote the use of site planning, solar orientation, cool roofs, and landscaping to decrease summer cooling and winter heating needs. Encourage the use of recycled content construction materials.

OSC-K-2 Identify opportunities for decreasing energy use through installation of energy efficient lighting, reduced thermostat settings, and elimination of unnecessary lighting in public facilities.

Over 200 new trees and other landscaping would be planted, as shown on the Project's Landscape Plan (see Figure 3). Dust abatement mitigations to control dust during construction are identified in the Air Quality Section under Mitigation Measure AQ-1.

General Plan Policies OSC- K-1 and K-2 address the goal of reducing energy use and using recycled content construction materials. The Project would comply with these policies as it would include integration of green technologies and design components, including energy efficiency systems, lighting, diversion of demolition waste, and use of recycled content construction materials wherever possible and available.

GM-A-1 Contain urban development in the Santa Rosa area within the City's Urban Growth Boundary.

The Project would comply with the above growth management policy because it would be located within the City's Urban Growth Boundary and is consistent with the City's General Plan.

VIIII(a) **Less than Significant Impact:** BAAQMD has established preliminary screening criteria. The screening criteria provide a conservative indication of whether a project would result in significant generation of GHG. The City developed the City's CAP to meet the requirements of the BAAQMD's criteria for a Qualified Greenhouse Gas Reduction Strategy. The Project will be subject to the applicable CAP requirements. If a project falls below these screening criteria and meets the City's CAP, it can be concluded that the project will result in less than significant impact from GHG emissions (See Section III. Air Quality).

Construction activities are considered temporary. Construction activities that would result in Project-related GHG emissions include exhaust emissions. BAAQMD has not adopted a threshold for construction related GHG emissions, but it does suggest determining whether construction GHG emissions would impede meeting AB 32 GHG reduction goals. Project emissions during construction would not result in a considerable contribution to the cumulative GHG impact, as the Project is lower than the construction screening criteria for ROG of 114 dwelling units. The Project will be consistent with the basic construction mitigation measures identified by BAAQMD and included as mitigation measure AQ-1. Mitigation measures to reduce impacts related construction are discussed in Section VIII, Hazards and Hazardous Materials (Mitigation Measure HAZ-2) as well as in Section III, Air Quality (Mitigation Measure

AQ-1). Implementation of all of the mitigation measures will further reduce potential hazardous releases to levels of less than significant.

The Project falls below the operation screening thresholds of 56 units as the Project replaces 6 existing homes with a 59-unit project. The homes shall incorporate numerous features including energy efficient homes, will implement CALGreen Tier 1 Standards and Title 24 building code requirements, decrease solar reflectivity, and support the use of non-vehicular forms of transportation (adjacent to parks and pathways) as detailed in the Project Description and Section III Air Quality. As the project falls below the BAAQMD significance thresholds, is consistent with the City's Climate Action Plan, it is determined that the Project will have a less than significant impact on GHGs.

VIII(b) **Less than Significant Impact.** Compliance with the City's CAP is evaluated above. The Project will not conflict with any plan adopted for the purposes of reducing emissions of greenhouse gases. The Project will comply with the State of California Tier 1 CALGreen requirements and the City's CAP as demonstrated by the CAP Checklist New Development Checklist, included as Appendix E. All mandatory requirements of the Santa Rosa's CAP New Development Checklist shall be implemented except where the item is not applicable or where a suitable substitution is provided.
The impact on GHGs would be less than significant.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa Climate Action Plan, adopted June 2012
- BAAQMD CEQA Guidelines, Page 3-2 to 3-4, May 2010
- Illingworth & Rodkin, Community Risk Assessment (TAC), Penstemon Place, March 8, 2017

IX. HAZARDS AND HAZARDOUS MATERIALS

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Discussion:

The site has been the subject of a Phase I Environmental Assessment prepared in April of 2015 by Harris & Lee Environmental Sciences, LLC (Attachment G).

Harris & Lee's interpretation of available historical aerial photographs indicated that the site was historically undeveloped land prior to the 1960s. In the mid to late 1960s the six single family residences were built on the western and southern perimeter of the site. The remainder of the property has remained undeveloped. The residential use has continued through the present. No historically recognized environmental conditions, activity, or other limitations, were identified in connection with the subject property. There is one septic system and two water wells located on the property. There have never been any documented commercial uses at the property.

Based on the analytical data collected during the Phase I ESA, Harris & Lee concluded that the historical use of the site does not represent any risk. Harris & Lee recommend no additional investigations regarding the environmental condition of the site are required.

IX(a,b,d) **Less Than Significant with Mitigation Incorporation. Hazardous Material transport and Exposure.** The Applicant is required to comply with all existing federal, state and local safety regulations governing the transportation, use, handling, storage and disposal of potentially hazardous materials. Prior to the commencement of site preparation, a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) will be prepared and implemented during all construction activities (See Section X Hydrology/Water Quality discussion below). In the event that construction activities involve the on-site storage of potentially hazardous materials, a declaration form will be filed with the Fire Marshall's office and a hazardous materials storage permit will be obtained. Compliance with required regulations governing hazardous materials will ensure that potential hazards to the public or the environment through the routine transport, use, or disposal of hazardous materials will be less than significant.

Project construction activities would include the use of materials such as fuels, lubricants, paints and solvents. Caltrans and the California Highway Patrol regulate the transportation of hazardous materials and wastes, including container types and packaging requirements, as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers. Because contractors are required to comply with laws pertaining to the handling of hazardous materials, the impacts would be less than significant.

There would be no new stationary source of hazardous emissions or handling of acutely hazardous materials or waste associated with the Project. Therefore, potential impacts would be less than significant.

There are several sites listed within 1-mile, the standard American Society for Testing and Materials (ASTM) search distance. A brief review of the listed sites reveals that they are not likely threats for the Subject Property due to one or more of the following reasons: listing database not relevant, sufficient distance from Subject Property, location relative to site topography and ground water flow direction, and the status of the listed site (e.g., closed, contamination characterized, contamination under remediation, etc.). Therefore, potential impacts would be less than significant.

The Project Site has no history of agricultural use. Therefore, the site has no risk of agricultural pesticides or human health risks associated with pesticide uses. The site does contain residual septic systems and 2 water wells. Both the septic systems and wells are slated for removal as part of the Project. Given the age of the existing structures on site (constructed circa 1950s), the presence of lead-based paint (LBP) and asbestos-containing materials (ACM) is considered likely. Mitigation measures (listed below) are provided to ensure that potential impacts to less than significant.

IX(c) **Less than Significant Impact. Hazards Relative to Schools.** The Project Site is not located within a quarter mile of a school. The nearest schools are: Kawana Elementary School (approximately 0.5 miles west of the project site) and Sonoma Academy (approximately 0.5 miles south of the project site). There are no activities associated with the proposed residential project that would pose a threat to schools from the release or handling of hazardous materials. Thus, the project would not result in any increased risk of exposure to existing or planned schools as a result of development. Therefore, no impacts related to the emission or handling of hazardous, or acutely hazardous materials, within one-quarter mile of an existing or proposed school are expected.

IX(e-f) **No Impact. Airports.** The Project site is located over 6 miles from an airport or airstrip, therefore, no impacts associated with airports are anticipated.

The Project has provided emergency access onto and around the site. The site development will not interfere with any adopted emergency response or evacuation plan and will have no impacts related to emergency response impairment.

IX(g) **Less than Significant Impact. Wildland Fires**. Wildland fires are of concern particularly in expansive areas of native vegetation of brush, woodland, grassland. The project site is located within the City's UGB, but at the edge of the urban area for the City of Santa Rosa. Surrounding land uses include Residential, Undeveloped Lands, and Agriculture, with the entire eastern edge of the property adjacent to the future Farmers Lane Extension.

The Project site is located on urban land in zones designated as "Non-Fire Hazard" by the California Department of Forestry and Fire Protection (CAL FIRE 2008). Therefore, no wildland fire related impact would occur.

Recommended Mitigation Measures:

HAZ-1: A Lead based Pain (LBP) survey shall be conducted within 6 months prior to any activities with the potential to disturb building materials to determine whether LBP is present. Further, in the event LBP is detected, the materials will be removed prior to any activities with the potential to disturb such materials.

HAZ-2: A comprehensive, pre-demolition ACM survey in accordance with the sampling protocol of the Asbestos Hazard Emergency Response Act shall be conducted within 6 months prior to any activities with the potential to disturb building materials to determine whether ACM are present. Further, in the event ACM is detected, the materials identified will be removed and disposed of prior to any activities with the potential to disturb such materials, in accordance with all applicable laws.

Standard Measures:

- Septic systems and water wells shall be abandoned per City and County code requirements.
- Construction chemicals shall be stored in enclosed and secure buildings per State and local regulations.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Harris & Lee Environmental Sciences, LLC, Phase I Environmental Site Assessments, April 2015

X. HYDROLOGY AND WATER QUALITY

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Would the project:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off- site?	☐	☐	☒	☐
d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off- site?	☐	☐	☒	☐
e. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f. Otherwise substantially degrade water quality?	☐	☐	☒	☐
g. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
i. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j. Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Discussion:

Attachment I, the Project's Preliminary Standard Urban Storm Water Management Plan, has been prepared by Carlile Macy, December 1, 2016, and serves as the basis for this analysis. Staff has reviewed the Preliminary SUSMP Report and it is in compliance.

The topography of the existing Penstemon site is hilly in the northeastern and eastern portions, sloping to flatter in the central and southern areas and is composed of three drainage areas. Average slope is 6.99% over the entire site. The steeper portions in the northeast and eastern portions of the site are over 10%. The southeastern and southwestern corners of the Project site drain in a southerly direction towards Linwood Avenue. The remaining site drains in a northerly direction towards Verbena Drive and the northwest corner of the site. The Project area currently consists of six single family homes and the remaining area consists of vacant undeveloped land.

Water Supply: The scope of review for the 2015 Urban Water Management Plan included the future residential development of the development area.

The City has had a long-standing commitment to water conservation. In 1976-77, the City began its water conservation program and over the years has implemented many innovative water conservation incentives, such as the Go Low Flow program (replacing toilets, showerheads and faucet aerators with ultra-low flow versions), washing machine rebate programs, landscape irrigation rebate programs, and other residential and commercial programs. Development fees fund the City's Water Conservation Program. In addition, CalGreen requires all new residential development to install water efficient fixtures, appliances and landscapes.

Water Quality: Stormwater, or runoff generated from rain, that is not absorbed into the ground accumulates debris, chemicals and other polluting substances harmful to water quality. Polluted stormwater entering creeks is a concern because of its threat to public health and the plant and animal life that inhabit waterways. Additionally, rain runoff from developments may increase flow rates and durations that cause hydromodification in creeks contributing to loss of habitat and decreased aquatic biological diversity.

The proposed development will include a network of roads and sidewalks for the proposed construction of a 59-lot residential subdivision. Runoff will be collected through a network of catch basins, field drains, culverts and drainage courses, preserving the site's historical drainage patterns.

The 10-year storm will be collected and contained within the proposed stormdrain pipe network. All of the drainage will be collected and conveyed to the stormdrains in Linwood Avenue and Verbena Drive. The Linwood Avenue existing stormdrain systems and the existing stormdrain system under Verbena Drive have the capacity to receive and convey the proposed Penstemon development. The proposed storm drain system will convey collected water into the existing public storm drain system at three connection points. The first connection point is to the existing 18" storm drain pipe that is located under Verbena Drive north of the site, the second connection point is to the existing 15" storm drain pipe located under

Linwood Avenue northwest of the site, and the third is to 36" storm drain pipe located under Linwood Avenue in the southwest corner of the site.

The Project will implement permanent storm water BMP's designed in compliance with the current Storm Water LID Technical Design Manual to achieve volume capture and treatment requirements. Storm water runoff from the site will primarily be captured for infiltration. The Project's Preliminary Standard Urban Storm Water Management Plan incorporates many LID measures into the Project design including capture of surface runoff, detention and infiltration, permeable pavement and bioretention. These features are described in detail in Attachment I, the Project's Preliminary Standard Urban Storm Water Management Plan which has received preliminary review by the City's Engineering Development Services Division.

X(a,e,f) **Less Than Significant Impact. Stormwater and Water Quality.** The Project's Preliminary Standard Urban Storm Water Mitigation Plan (SUSMP) identifies permanent Storm Water Best Management Practices (BMP's) designed and implemented in accordance with the City of Santa Rosa and County of Sonoma Low Impact Development (LID) Technical Design Manual to achieve volume capture and treatment requirements. All runoff generated by the water quality design storm will be treated on site. The increase in runoff volume generated from the water quality design storm, due to the proposed development, will be infiltrated on site. The onsite BMPs will control and minimize the pollutant loadings from impervious surfaces thereby decreasing the adverse impacts from stormwater runoff on water quality. These measures will ensure the Project will have a less than significant impact.

X(b) **Less Than Significant Impact**. **Groundwater.** As the Project is consistent with the City's General Plan, the Project's water demand has been addressed in the City's 2015 Urban Water Management Plan and Water Supply Assessment. The impacts are therefore considered less than significant.

X(c-d) **Less Than Significant Impact. Drainage** The Project will alter on-site drainage by increasing the area of impervious surfaces by 5.2 acres and increasing site runoff. However, this increase in runoff will be offset by incorporating BMP's designed in accordance with the City of Santa Rosa and County of Sonoma Low Impact Development (LID) Technical Design Manual to achieve volume capture and treatment requirements which will control and minimize the potential for erosion, siltation, and flooding resulting in a less than significant impact. Standard measures to reduce pervious surfaces to reduce the Design runoff factor coefficient and onsite storm water detention/storage surfaces shall be incorporated into the final Project design. The proposed storm drain system will be designed to contain the 10 year storm event underground and roadways will be designed to provide additional surface routes to convey the 100 year storm event preventing on site flooding in accordance with the Sonoma County Water Agency Flood Control Design Criteria reducing impacts to a level of less than significant.

X(g-j) **No Impact. Flooding.** The site is not located within 600' of an edge to a mapped flood hazard area located south of the Project. The site is not located near a dam or levee, nor is it located within a flood plain or a mapped flood hazard area within its boundaries. Therefore, there is no impact related to flooding as a result of a levee or dam failure.

Seiche and tsunamis are short duration, earthquake-generated water waves in large enclosed bodies of water and the open ocean, respectively. The extent and severity of a seiche would be dependent upon ground motions and fault offset from nearby active faults. The site is not located near the Pacific Ocean or large bodies of water. Therefore, the risk of seiche or tsunami damage at the site is low to non-existent and will have no impact.

Mitigation Measures:

None required.

Standard Measures:

- The developer's engineer shall comply with all requirements of the City Standard Storm Water Mitigation Plan Guidelines using Low Impact Development (LID) Best Management Practices (BMPs). Final Plans shall address the stormwater quality and quantity along with a maintenance agreement or comparable document to assure continuous maintenance of the source and treatment.
- The Applicant shall submit landscape and irrigation plans in conformance with the Water Efficient Landscape Ordinance adopted by the Santa Rosa City Council. Plans shall be submitted with the Building Permit application. The Applicant shall submit the following with the above-mentioned plans: Maximum Applied Water Allowance and Hydrozone Table.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa, Water Efficient Landscape Ordinance, Ordinance 4051, adopted October 27, 2015
- Carlile-Macy, Preliminary Standard Urban Storm Water Mitigation Plan, December 1, 2016
- Jesus McKeag, City of Santa Rosa, December 12, 2016

XI. LAND USE & PLANNING

Would the project?	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Physically divide an established community.	☐	☐	☐	☒
b. Cause a significant environmental impact due to a conflict with a land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

Discussion:

The 9.7-acre site is located at 2842, 2862, and 2574 Linwood Avenue, in the Southeast quadrant of Santa Rosa. It is identified as Assessor Parcel Nos. (APN) 044-200-027, -029, and -040. The property is part of a larger planned development, the Southeast Area Planning Area, approved in 1994. The site is within the PD (Planned Development) zoning district, which is consistent with the General Plan Land Use Diagram or Low-Density Residential, which allows development at a density of 2-8 units per acre. The site is currently developed with six (6) existing single-family homes, which were constructed on the site in the 1960s. Only four of the homes are currently habitable.

The Project proposes development of 59 single-family residential units. Lots 53 and 13 will have second units. Lots 17, 29, 31 and 59 will have the option for second units. The proposed density is six dwelling units per acre. Lots will range in size from 3,200 square feet to 19,300 square feet with an average of 5,900 square feet. Twelve (12) of these new homes are designed on 4-unit auto courts.

Six (6) different homes have been designed for this Project. Plans 1 and 2 are designed for the auto courts. Both are 2-story homes with Plan 1 including approximately 1,661 square feet of living area and Plan 2 including approximately 1,887 square feet of living area. Plans 3 and 4 are single-story homes with Plan 3 including approximately 1,779 square feet of living area and Plan 4 including approximately 1,384 square feet of living area. Plans 5 and 6 are 2-story homes with Plan 5 including approximately 2,114 square feet of living area and Plan 6 including approximately 2,572 square feet of living area.

Single-family residential homes are adjacent to the site along the northerly, westerly, and southerly boundaries. Vacant land and Right-of-Way for the planned Farmers Lane Extension is adjacent to the site on the East. Verbena Drive is stubbed out along the northerly boundary and will be continued onto the site. The Dauenhauer Neighborhood Park is approximately 1,100 feet (less than ¼ mile) north of the site.

The project requires a CUP because it proposes a small lot subdivision. The project complies with the all applicable development standards set forth in City of Santa Rosa Zoning Code Section 20-42.140 including lot coverage, building setbacks, building height, and private open space,

The site slopes generally from east to west with 80% of the site having slopes of less than 10%. The average slope of the site is 6.99%. A portion of the proposed development will be on slopes over 10%. As such, the Project also requires a Hillside Development Permit. As designed, the Project complies with the City of Santa Rosa Zoning Code, Chapter 20-65, Hillside Development Standards.

Impacts:

XI(a) **No Impact.** The site is located near the edge of City limits. It is surrounded by single-family residential uses to the north, west and south. The property immediately to the east is undeveloped. The Project will not physically divide an established community. The Project is in an area that is developed with residential uses as called for in the City's General Plan. The eastern edge of the site will be bordered by the Farmers Lane Extension. The Project would not physically divide an established community and no impact is anticipated.

XI(b) **Less Than Significant Impact.** The Project will be consistent with the existing Low Density Residential General Plan land use designation which was included in the scope of review of the City of Santa Rosa 2035 General Plan/Final EIR, adopted by City Council Resolution No. 27509, dated November 3, 2009.

The Project is not located in a Special Purpose Zoning District, nor is the Project location is not located in the Coastal Zone and there are no specific plans that apply to the Project area. The Project site is not located within a habitat conservation plan or priority conservation area, and all tree removal will be incompliance with the City's Tree Ordinance, City Code Chapter 17-24.

As designed the Project complies with development standards set forth in the Policy Statement for the Planned Development, and both the City's Hillside Development and Small Lot Subdivision Ordinances, as discussed above. The project supports General Plan Policy OSC-B-2, which requires that alteration to slopes greater than 10 percent be minimized to the extent practicable and OSC-B-5, which requires a Hillside Development Permit for all new development and land subdivision on slopes greater than 10 percent. As described in Section I Aesthetics, the project is consistent with Hillside Development Standards (Section 20-32.020 B), and has demonstrated compliance for stormwater retention requirements for construction and operation, and is conditioned as such as a standard condition of approval.

As the Project will comply with the City of Santa Rosa ordinances and standard conditions approval, impacts will be less than significant.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa Zoning Code, 2006
- City of Santa Rosa Southeast Area Plan, Resolution No. 21807, June 21, 1994

XII. MINERAL RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Discussion:

The Surface Mining and Reclamation Act (SMARA) of 1975 identifies specific areas of mineral resources in the North San Francisco Bay Region including Santa Rosa. The Project does not lie within one of the listed aggregate deposits in the SMARA report as shown on Santa Rosa Quadrangle.

XII(a-b) **No Impact.** The development of the Project site will not create an adverse impact upon locally or regionally significant resources as the City of Santa Rosa's General Plan does not identify any locally important mineral resource locations in the vicinity of the Proposed Project.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR.
- State of California, Surface Mining and Reclamation Act (SMARA) of 1975, updated in 1977

XIII. NOISE

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in standards established in the local general plan or noise ordinance or applicable standards or other agencies?	☐	☒	☐	☐
b. Generation of excessive ground borne vibration ground borne noise levels?	☐	☒	☐	☐
c. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion:

A noise study was prepared for the Project by Illingworth & Rodkin, Inc. in July 13, 2017 and is found in Attachment E.

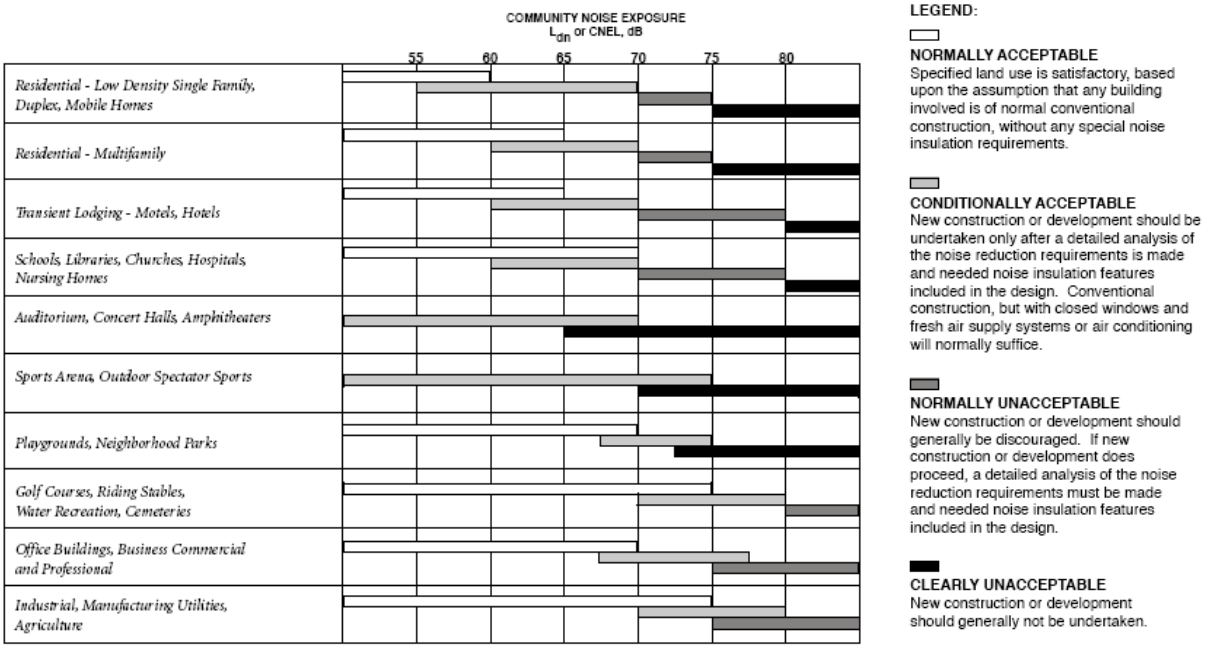
Regulatory Criteria

The State of California and the City of Santa Rosa have established regulatory criteria that are applicable in this assessment. The California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

City of Santa Rosa General Plan 2035. The City of Santa Rosa's General Plan[3] includes the Noise and Safety Element, which provides guidelines to achieve the goal of maintaining an acceptable community noise level. The goals and policies applicable to the Proposed Project are discussed in the Noise Assessment contained in Attachment E. The City's Noise Guidelines as they relate to land use compatibility are found in Table XIII-1 below.

[3] Santa Rosa General Plan 2035, November 3, 2009.

Table XIII-1: Land Use Compatibility Standards, City of Santa Rosa General Plan



Santa Rosa Noise Ordinance. The City of Santa Rosa has adopted a quantitative noise ordinance in Chapter 17-16 of the Santa Rosa Noise Ordinance. Section 17-16.120 regulates noise from stationary machinery and equipment and states the following:

> "It is unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels."

The ambient base noise levels for residential, office, commercial, and industrial areas are established in Section 17-16.030. The applicable ambient noise level criteria are shown below:

TABLE XIII-2: Santa Rosa Noise Ordinance Ambient Base Noise Levels

Land Use Zone	Daytime Level (7:00 am - 7:00 pm)	Evening Level (7:00pm - 10:00pm)	Nighttime Level (10:00pm - 7:00am)
Single-Family Residential (R1 and R2)	55 dBA	50 dBA	45 dBA
Multi-Family Residential	55 dBA	55 dBA	50 dBA
Office and Commercial	60 dBA	60 dBA	55 dBA
Intensive Commercial	65 dBA	65 dBA	55 dBA
Industrial	70 dBA	70 dBA	70 dBA

Source: Santa Rosa Noise Ordinance 17-16.030.

Existing Noise Environment

The Project site is located in the northeast corner of the Taylor Mountain Place/Linwood Avenue intersection in the City of Santa Rosa. Single-family residential land uses surround the Project site to the north, to the south, to the west, and to the east. The site is currently developed with six rural single-family residences. A noise monitoring survey was completed in March of 2017, and these are detailed in Attachment E. The monitoring survey included two long-term noise measurements and one short-term

noise measurement which are shown on Figures in Attachment E, and in Tables XIII-3a and XIII-3b, below. Traffic noise along the local roadways that serve the Project site is the predominant source of environmental noise. Occasional overhead aircraft associated with the Charles M. Schulz-Sonoma County Airport are also audible at times at the site.

TABLE XIII-3a: Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10)}$	DNL[a]
ST-1: ~20 feet north of the centerline of Linwood Drive	3/2/2017, 11:00-11:10	58	48	41	35	34	39	<50

[a] DNL was approximated by correlating to corresponding period at long-term site.

TABLE XIII-3b: Summary of Long-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	Daytime Hours, 7:00 a.m. to 10:00 p.m. Range (Average)		Nighttime Hours, 10:00 p.m. to 7:00 a.m. Range (Average)		DNL
		L_{max}	L_{eq}	L_{max}	L_{eq}	
LT-1: northern boundary of project site	3/2/2017 at 10:40 3/3/2017 at 16:10	48-70 dBA (56 dBA)	41-51 dBA (45 dBA)	43-60 dBA (49 dBA)	39-50 dBA (43 dBA)	51
LT-2: ~20 feet east of centerline of Linwood Avenue	3/2/2017 at 10:50 3/3/2017 at 16:00	67-87 dBA (73 dBA)	51-60 dBA (57 dBA)	40-87 dBA (59 dBA)	39-58 dBA (48 dBA)	60

Noise and Land Use Compatibility

The compatibility of proposed exterior use areas is assessed by comparing predicted levels against the Land Use Compatibility Standards established in the City of Santa Rosa General Plan. The City of Santa Rosa considers residential exterior use areas in single-family residential developments "normally acceptable" in noise environments of 60 dBA DNL or less. Interior noise levels shall be maintained so as not to exceed 45 dB DNL.

Future Exterior Noise Environment

The future noise environment at the Project site would result primarily from vehicular traffic along the future Farmers Lane Extension that is planned along the eastern boundary of the Project site. Traffic along neighborhood roadways serving the Project site and vicinity would also affect the noise environment on the Project site. To estimate the future traffic levels at the backyards of the proposed single-family residences adjacent to the future Farmers Lane Extension, an acoustical model of the Project site and the surrounding area was developed using the Federal Highway Administration's (FHWA) Traffic Noise Model, version 2.5 (TNM). Based on the Project description, the roadway elevation of the future Farmers Lane Extension would be situated on the hillside above the Project site in order to mitigate traffic noise at the site without the inclusion of sound barriers (discussed below and included in Attachment E. For the purposes of this Project, an average daily traffic (ADT) volume of 14,100 vehicles is assumed along the Farmers Lane Extension (ADT projections for the Farmers Lane extension based on the Sonoma County Transportation Authority traffic model, as provided by W-Trans). To model the worst hour scenario in TNM, it was assumed that 10% of the ADT would occur during the peak traffic hour. Additionally, a traffic study for the Proposed Project was completed in April 2017 by W-Trans. Included in the study were peak hour traffic volumes for the Linwood Avenue/ Poinsettia Lane intersection. These traffic volumes were also used as inputs in the TNM model.

The backyards of proposed residential units would be subject to the City's "normally acceptable" noise and land compatibility standards, which Figure 12-1 of the City's General Plan identifies as 60 dBA DNL. Typically, noise levels are assessed in the center of the backyard areas, at least five feet from any nearby

reflective surfaces, such as the residential units or noise barriers. The backyards, which are shown in pale yellow in Figure 1, for residences 35 through 46 adjoin the future Farmers Lane extension; however, the extended backyards of these residences include a significant elevation increase from the residential pad elevation to the future roadway surface of the Farmers Lane extension. Therefore, the receptors for these backyards were positioned at the base of the slope, five feet above the residential pad elevation. According to the site plan, a six-foot solid wooden privacy fence would be located along the backyard and side yard perimeters of each residence on the project site. This privacy fence was not included in the TNM model in order to show the unmitigated traffic noise levels.

Based on the results of the traffic noise model, residences 35 through 45 would be exposed to unmitigated future noise levels resulting from Farmers Lane extension below 60 dBA DNL. Residence 46, which is located at the future corner of Farmers Lane and Linwood Avenue would result in future exterior noise levels up to 61 dBA DNL. Due to greater setbacks from the Farmers Lane extension, the low volumes of the neighborhood roadways, and proposed residential structures providing partial shielding from the traffic noise, the remaining residences throughout the project site would be exposed to future exterior noise levels at or below 60 dBA DNL.

Residences 1, 3, 5, 7, 9, 11, 13, 52, and 53 are adjacent to Linwood Avenue, and the backyards of each of these residences would have direct line-of-sight to the traffic along the roadway. With the center of each of these backyards set back approximately 60 feet, the future exterior noise levels due to traffic noise along Linwood Avenue would be below 60 dBA DNL. Residences 53 through 59 are adjacent to the Linwood Avenue alignment in the east-west direction; however, the front yards of these residences would be facing the roadway, and the structures would provide adequate shielding from the traffic noise along this roadway.

The backyards of the residences located on the interior of the site would have great enough setbacks from roadways and adequate shielding provided by the intervening residential structures to result in future noise levels below 60 dBA DNL.

Future Interior Noise Environment

Based on the TNM results discussed above, the first floors of residences 35 through 46, which are adjacent to the future Farmers Lane extension, would be exposed to future exterior noise levels up to 61 dBA DNL. However, due to the elevation of the roadway being approximately 20 feet above the pad elevation of the residences, the rooms on the second floors of these residences would be exposed to future exterior noise levels up to 64 dBA DNL.

The southern façades of residences 53 through 59 would be set back from the centerline of Linwood Drive (east-west alignment) by approximately 40 to 55 feet, and the western façades of residences 1, 3, 5,7, 9, 11, 13, 52, and 53 would have setbacks of approximately 40 feet from the centerline of Linwood Avenue. At these distances, the rooms facing these roadways would be exposed to future exterior noise levels below 60 dBA DNL.

All residences located on the interior of the site would receive adequate shielding from the intervening buildings. The exterior-facing façades of the residences located on the interior of the site would be exposed to future exterior noise levels below 60 dBA DNL.

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source,

sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Impacts:

XIII(a) **Less Than Significant with Mitigation Incorporated**. **Substantial Noise Levels**. The proposed project could potentially generate noise in excess of standards established in the City's Municipal Code at the nearby sensitive receptors (See Regulatory Criteria, above), which unless mitigated could be substantial.

Mechanical Equipment Noise: Section 17-16.120 of the City's Noise Ordinance limits noise levels produced by stationary mechanical equipment to 60 dBA during daytime hours (7:00 a.m. to 7:00 p.m.), to 55 dBA during evening hours (7:00 p.m. to 10:00 p.m.), and to 50 dBA at night (10:00 p.m. to 7:00 a.m.) at single-family residential property lines. Typically, these noise limits do not apply to construction activities, and the "unlawful" noise statement in Section 17-16.120 does not indicate construction noise as included in these noise thresholds.

The proposed project would include mechanical equipment such as heating, ventilation, and air conditioning systems. Information regarding the location, number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. While the site plan does not show the location of the air conditioning units, this type of equipment is typically located on the ground floor around the perimeter of the residential structures. Typically, air conditioning units are located on the sides or back of the residences. Typical air conditioning units and heat pumps for single-family residences generate noise levels of about 60 dBA Leq at a distance of 50 feet. This type of equipment could run continuously during the daytime and nighttime. Along the northern boundary of the project site, the proposed project has a shared property line with existing single-family residences. Assuming worst-case scenario conditions, air conditioning units for the proposed residences would be located within 15 to 25 feet of the shared property line. The Noise Assessment assumed locations that would generate the worst-case noise levels at the nearest adjacent residences. However, these findings will be re-evaluated during final design when type of equipment, noise levels for the equipment, and location of the equipment is known. At these distances, the project-generated mechanical equipment noise would range from 66 to 71 dBA Leq. With the inclusion of the six-foot wooden privacy fence along the shared perimeter line, these noise levels would reduce by approximately 5 dBA. The expected mechanical equipment noise levels would potentially exceed the City's daytime, evening, and nighttime noise levels. This would be a potentially significant impact unless mitigated by the implementation of Mitigation Measure NOI-1, below, which would bring the impact to a level of less than significant.
.
Future Exterior Noise Environment: As discussed above, most of the residences would meet the City's 60 dBA DNL threshold for exterior noise levels; however, future noise levels at the backyard of residence 46 is expected to exceed the "normally acceptable" threshold by up to 1 dBA DNL. This would result in a significant impact unless mitigated by the implementation of Mitigation Measure NOI-2, below, which would bring the impact to a level of less than significant.

Future Interior Noise Environment: Assuming windows to be partially open, the interior noise levels for the Proposed Project would be up to 49 dBA DNL at the exterior-facing rooms adjacent to the future Farmers Lane Extension, as discussed above. Noise levels would exceed the 45 dBA DNL threshold for interior noise levels. This would result in a potential impact unless standard construction includes the implementation of noise insulation features as discussed in Mitigation Measure NOI-2. With the implementation of this mitigation measure, the impact would be reduced to a less than significant level.

The existing noise environment is dominated by existing traffic noise, as stated in Noise Assessment in Appendix E. With the project, the noise environment would continue to be dominated by local traffic noise, but the project would result in an increase in traffic volumes. Therefore, the permanent noise increase was calculated using the increase in traffic volumes.

Permanent Noise Level Increase: Based on Policy NS-B-14 of the City of Santa Rosa General Plan, a significant impact would occur if the Proposed Project would result in a permanent noise level increase due to Project-generated traffic of 5 dBA DNL or greater at sensitive receptors located within 250 feet of the Project site. For reference, a 5 dBA DNL noise increase would be expected if the Project would triple existing traffic volumes along a roadway.

The Project trips included in the traffic study completed by W-Trans for the Proposed Project were added to the existing peak hour traffic volumes to generate existing plus Project peak hour volumes. When comparing the existing plus Project volumes to the existing volumes, the noise level increase due to Project-generated traffic was 1 dBA DNL along Linwood Avenue/Taylor Mountain Place in the vicinity of the Project site. At all other roadway segments included in the traffic study, the resulting noise level increase due to Project-generated traffic was less than 1 dBA DNL. This impact is less-than-significant.

Cumulative Noise Increase: A significant impact would occur if the cumulative traffic noise level increase was 5 dBA DNL or greater and if the Project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA DNL or more attributable solely to the Proposed Project.

The existing noise environment is dominated by existing traffic noise, as stated in Noise Assessment in Appendix E. With the project, the noise environment would continue to be dominated by local traffic noise, but the project would result in an increase in traffic volumes. Therefore, the permanent noise increase would be determined calculated using the increase in traffic volumes.

The Project trips were added to the future traffic volumes included in the traffic study, and both future peak hour traffic scenarios (i.e., future no Project and future plus Project) were compared to the existing peak hour traffic volumes. These increases were estimated for each roadway segment for which we had traffic and were independent of the Farmers Lane extension. All of the estimates provided in this impact were based on volumes provided in the Project's traffic report, which did not include information regarding the Farmers Lane extension.

While traffic noise increases of 5 dBA DNL or more were calculated along Linwood Avenue, north of Aston Avenue, and along Kawana Springs Road to the east and west of Taylor Mountain Place, these traffic noise increases were calculated for both future scenarios (with and without the Project). At all other roadway segments included in the traffic study, the calculated traffic noise increase was less than 5 dBA DNL under both future scenarios. Since the traffic noise level increase of both future scenarios would be the same with and without the Project, the Proposed Project would not make a cumulatively considerable contribution to increased noise levels at any roadway segments.

As discussed above, the Proposed Project will not result in a substantial permanent noise level increase due to project-generated traffic at the existing noise-sensitive land uses in the project vicinity. Additionally, the proposed project would not make a cumulatively considerable contribution to future noise levels at residential land uses in the project vicinity.

Temporary Noise

Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to Project construction activities. The incorporation of construction best management practices as Project conditions of approval would result in a less-than-significant temporary noise impact.
Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

The City of Santa Rosa does not define allowable construction hours in the General Plan or Municipal Code, but it is assumed that construction would be limited to daytime hours only. The thresholds for speech interference indoors are about 45 dBA L_{eq} for steady noises. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities exceeded 60 dBA L_{eq} at nearby residential properties and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

To the north, existing residential land uses share a property line with the project site, and the existing daytime ambient noise levels at these residences would range from 41 to 51 dBA L_{eq}, as measured at LT-1. Existing residences to the south and to the west, which are both opposite Linwood Avenue, would have daytime ambient noise levels ranging from 51 to 60 dBA L_{eq}, as measured at LT-2. Ambient levels for the nearest rural residences, who's property line is approximately 255 feet east of the project site, would have similar daytime ambient noise levels to those measured at LT-1, which would range from 41 to 51 dBA L_{eq}. All of these ambient noise environments are based on the existing noise measurements made during the March 2017 survey and are discussed in further detail in the Noise Assessment included in Appendix E.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source. Typical hourly average construction-generated noise levels for residential developments are about 81 to 88 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Tables for maximum instantaneous noise levels of individual pieces of construction equipment and for typical hourly average construction noise levels broken down by phase are provided in the Noise Assessment in Appendix E.

Hourly average construction noise levels associated with the erection of the structures, such as hammer- and drilling-related noise, range from approximately 63 to 71 dBA L_{eq} at a distance of 50 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA noise reduction at distant receptors.

Construction for the Project is expected to begin in early winter of 2020 and is expected to be completed in fall of 2021, which would be a total of 17-18 months. This would exceed one year. Construction activities would include site preparation, excavation, grading, trenching, building construction, paving, and architectural coating. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Table XII-5 shows the hourly average noise level ranges, by construction phase expected for the proposed Project when construction activities would occur near the shared property line of the adjacent existing residence, which would represent the worst-case scenario. While construction activities move away from these shared property lines, construction noise levels would decrease by up to 37 dBA at the north residences, by up to 23 dBA at the south residences, by up to 9 dBA at the east residences, and by up to 23 dBA at the west residences.

Once construction moves indoors, minimal noise would be generated at off-site locations. The range of levels for the trenching phase reflects a 3-4 month period when this phase would overlap with the grading/excavation phase. Similarly, the range of levels for the building-interior/architectural coating phase reflects a 9-10 month period and would overlap with the building-exterior phase.

As shown in Table XIII-4, construction noise levels would exceed 60 dBA L_{eq} at the nearby residences under worst-case conditions during each phase of project construction. Ambient levels at the surrounding

residences would be exceeded by more than 5 dBA L_{eq} during each phase, as well. However, depending upon the location on the project site of the active construction work, the surrounding residences would be exposed to varying noise levels at any given time. Since construction activities are expected to last more than one year and noise for the proposed project is expected to exceed the City's daytime threshold of 60 dBA L_{eq} at the existing residential property lines and exceed ambient levels at the nearby residences by more than 5 dBA L_{eq}, this would be a significant impact.

TABLE XIII-4: Estimated Worst-Case Scenario Construction Noise Levels at the Nearby Residences

Phase	Construction Equipment (Quantity)	Calculated Hourly Average L_{eq}			
		North Res (10ft)[c]	South Res (50ft)[d]	East Res (220ft)[e]	West Res (45ft)f
Site Preparation	Rubber-Tired Dozer (3) Tractor/Loader/Backhoe (4)	102	88	75	89
Grading/ Excavation	Excavator (1) Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	101	87	74	88
Trenching	Tractor/Loader/Backhoe (1) Excavator (1)	96-102[a]	82-88[a]	69-75[a]	83-89[a]
Building-Exterior	Crane (1) Forklift (3) Generator Set (1) Tractor/Loader/Backhoe (3) Welder (1)	100	86	73	87
Building-Interior/ Architectural Coating	Air Compressor (1) Aerial Lift (1)	89-100[b]	75-86[b]	62-74[b]	76-87[b]
Paving	Paver (2) Paving Equipment (2) Roller (2)	101	87	74	87

[a] The range of levels for the trenching phase reflects the trenching equipment only and the overlapping period with the grading/excavation phase.
[b] The range of levels for the building-interior/architectural coating phase reflects the building-interior/architectural coating equipment only and the overlapping period with the building-exterior phase.
[c] As construction moves south of the northern property line, construction noise levels would decrease by up to 37 dBA.
[d] As construction moves north of the southern property line, construction noise levels would decrease by up to 23 dBA.
[e] As construction moves west of the eastern property line, construction noise levels would decrease by up to 9 dBA.
[f] As construction moves east of the western property line, construction noise levels would decrease by up to 23 dBA.

Mitigation Measures NOI-4, below, would reduce noise levels by 5 to 10 dBA. While the surrounding noise-sensitive receptors would still potentially be exposed to temporary construction noise levels exceeding daytime ambient conditions, it is not projected that these daytime thresholds would be exceeded for over one year, assuming the implementation of these best management practices. This mitigation would reduce the potential impact to a level of less than significant.

XIII(b) **Less Than Significant with Mitigation Incorporated. Groundbourne Vibration or Levels.** Construction-related vibration caused by some types of construction activity could be in excess of 0.3 in/sec PPV at the existing residences located adjacent to the project site. This is a significant impact.

Groundborne Vibration: The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition, preparation work, foundation work, and new building framing and finishing. The proposed project would not require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. While no historical buildings or buildings that are documented to be structurally weakened adjoin the project site, details regarding the residences surrounding the project site were not provided at the time of this study. For the purposes of this study, therefore, groundborne vibration levels exceeding the conservative 0.3 in/sec PPV limit would have the potential to result in a significant vibration impact.

Table XIII-5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

For the purposes of calculating vibration levels, the distances provided here reflect the distances from the existing residential structures to the project site. The nearest structures to the project site are residential dwellings adjacent to the north. These residences range from within 10 feet from the shared property line to 50 feet. Vibration levels at these distances would range from 0.01 to 0.58 in/sec PPV, which exceeds the 0.3 in/sec PPV significance threshold at the nearest residences. To the south, opposite Linwood Avenue, the nearest single-family residential structures are approximately 60 to 70 feet from the project's southern boundary. At these distances, vibration levels would be range from 0.07 to 0.08 in/sec PPV. The single-family residence to the east of the project site is approximately 325 feet from the project site, which would result in vibration levels up to 0.01 in/sec PPV. The residences to the west of the project site, opposite Linwood Avenue, would range from 55 to 80 feet from the project's western boundary. At these distances, vibration levels would range from 0.06 to 0.09 in/sec PPV.

Construction activity for the proposed project could potentially result in "architectural" damage to the residences adjacent to the site to the north. This is a significant impact unless mitigated through implementation of Mitigation Measure NOI-3, below, which would reduce the impact to less than significant.

TABLE XIII-5: Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)	Approximate L_v at 25 feet (VdB)
Pile Driver (Impact)	Upper range	1.158	112
	Typical	0.644	104
Pile Driver (Sonic)	Upper range	0.734	105
	Typical	0.170	93
Clam Shovel Drop		0.202	94

Equipment		PPV at 25 feet (in/sec)	Approximate L_v at 25 feet (VdB)
Hydromill (Slurry Wall)	In soil	0.008	66
	In rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Loaded Trucks		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

The project shall prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy objects, within 20 feet of any adjacent residences (NOI-3) which will reduce the potential for significant impacts to less that significant.

XIII(c,f) **No Impact. Airport-Related Noise.** The Project site is not located within an airport land use plan, or within two miles of a public airport, public use airport or private air strip. Occasional aircraft overflights are intermittently audible at the site, but these infrequent events do not substantially contribute to hourly average or daily average noise levels at the site. The Project would not expose persons in the area to excessive aircraft noise, therefore no impact will occur.

Mitigation Measures:

NOI-1: Mechanical Equipment. Mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's noise level requirements. A qualified acoustical consultant shall be retained to review mechanical noise as these systems are selected to determine specific noise reduction measures necessary to reduce noise levels into compliance with the Noise Ordinance, City Code Chapter 17-16. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers such as enclosures and parapet walls to block the line-of-sight between the noise source and the nearest receptors. Alternate measures may include locating equipment in less noise-sensitive areas, where feasible. Implementation of the measure will reduce impacts to a level of less than significant.

NOI-2: Interior/Exterior Noise Levels. The following noise insulation features shall be incorporated into the proposed Project to reduce interior noise levels to 45 dBA DNL or less:

a) Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, on the Project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards. While the first flor rooms would be mostly shielded, the upper floors would be closer in elevation to the roadway and would not receive the shielding from the fence. The forced-air mechanical ventilation would be required at the residences on Lots 35 through 46 to ensure the 45 dBA DNL interior noise level threshold is met within residences.

b) A solid six-foot privacy fence will be constructed along the perimeter of the backyards of each residence. The 60 dBA DNL threshold for exterior use areas of single-family residences are

typically applied at the center of outdoor use areas. For this reason, receptors were positioned at the center of each backyard for Lots 35 to 46 adjacent to the Farmers Lane extension, for Lots 1 through 24 and 34 along the northern perimeter, for Lots 47 through 59 near the southern perimeter, and for Lots 25 through 30 to represent the second row of homes from the Farmers Lane extension. The only backyard that exceeded 60 dBA DNL when no fence was modeled was Lot 46, and it exceeded the limit by 1 dBA. A 6-foot fence typically provides about 5 dBA of noise reduction but due to the elevation difference between the receptor and the roadway, the fence would provide a 2 dBA reduction. The resulting noise level would be 59 dBA DNL with the fence.

c) It is recommended that the fence at the corner Lot 46 rap around to the side yard approximately 65 feet to provide maximum noise reduction. With the inclusion of acoustical shielding provided by this fence, the noise levels at the backyard of residence 46 would be less than 60 dBA DNL meeting the City's "normally acceptable" noise level threshold for private outdoor use areas in new single-family developments.

NOI-3: Construction Equipment. Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy objects, within 20 feet of any adjacent residences.

NOI-4: Construction Noise. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life.

The City shall require the contractor to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the Project vicinity through the development of a construction noise control plan, including, but not limited to, the following available controls:

a) Construction and noise-generating activities related to construction shall be limited to 7:00 a.m. to 7:00 pm. Monday through Friday, and 8:00 a.m. to 6:00 p.m. Saturday. No noise-generating activities relating to construction are permitted on Sundays and holidays.

b) Avoid overlapping construction phases (the overlapping of the construction phases increases the number of potential pieces of large equipment that could be used simultaneously, which could increase noise levels by up to 8 dBA).

c) Construct temporary noise barriers, to screen stationary noise-generating equipment. Assuming a height of 10 feet, temporary noise barrier fences would provide at least 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

d) Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

e) Unnecessary idling of internal combustion engines shall be strictly prohibited.

f) Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

g) Utilize "quiet" air compressors and other stationary noise sources.

h) Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the Project site during all Project construction.

i) Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

j) Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the Project site.

k) The contractor shall prepare a detailed construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

l) Designate a "disturbance coordinator" who would be responsible for responding to all complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

The implementation of the reasonable and feasible controls outlined above would reduce construction noise levels emanating from the site by 5 to 10 dBA in order to minimize disruption and annoyance. Temporary barriers would provide 5 to 10 dBA reduction. And considering that construction equipment would move about the site and consist of interior work for a time, any individual residence would not be exposed to construction noise levels exceeding 60 dBA Leq & exceeding ambient levels by 5 dBA for a period over 1 year. Additionally, as houses on the site are constructed, these future structures would also provide additional shielding. With the implementation of these controls, the impact would be reduced to a less-than-significant level.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Illingworth & Rodkin, Inc., Environmental Noise Assessment Study for the Penstemon Place Project, March 29, 2017
- W-Trans, Draft Traffic Impact Study for the Penstemon Place Project, January 2018

XIV. POPULATION AND HOUSING

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐

Discussion:

Changes in population (and housing) in and of themselves are generally characterized as social and economic effects and are not considered physical effects on the environment. CEQA provides that economic or social effects are not considered significant effects on the environment unless the social and/or economic changes are connected to physical environmental effects.

While an increase in population resulting from new development does not necessarily cause direct adverse physical environmental effects, indirect physical environmental effects such as increased vehicle trips and associated increases in air pollutant emissions and noise could occur. These potential impacts are analyzed throughout this IS/MND.

XIV(a-b) **Less Than Significant Impact. Population Inducement.** The Project site housed 6 single family units in the past, 4 of which are still habitable and occupied (as of the winter of 2019). The remaining units which were abandoned are about to be, or have been, razed and will be replaced with the proposed new Project houses. The Project will provide 59 new housing units and expand infrastructure accordingly. The population associated with the new project is estimated to be 156 residents.[4] The Project site is designated as Low Density Residential on the General Plan Land Use Diagram, which allows development at a density of 2-8 units/acre. Implementation of the proposed project would result in a change in land use as compared to existing conditions, but would be consistent with the City's intent to develop the site for residential uses. Changes in land use are regulated by the planning policies adopted by each local governmental jurisdiction in California. Therefore, this change in land use is evaluated in comparison to the planning goals and policies contained in the City's General Plan. General plans provide the long-term objectives, principles, and standards for development, and all development proposals must be generally consistent with the overall land use guidance provided in a general plan. More detailed regulation and land use controls are applied through the City's zoning, subdivision, and grading requirements, as well as through other City regulations and ordinances. The project's consistency with applicable ordinances, as well as specific land use implications associated with development of the project, are discussed other sections of this IS/MND.

Construction of 59 dwelling units at the project site will add to the City's housing inventory and help to meet the Regional Housing Needs Allocation (RHNA) as identified in the City's Housing Element. Given the scope and scale of the proposed development, at an additional 59 units, the project is not expected to induce substantial population growth in the area. Therefore, population impacts from the proposed project would be considered less than significant.

[4] *Based upon the average population per household of 2.63 (2015 Census data).*

XIV(b-c) **Displacement of People or Housing. The** site is currently developed with 6 residential units, four of which are currently habitable and occupied. The tenants will be required to relocate and be given notice as required by State and local regulations. The loss of their housing units will be offset by 59 new units and will not result in a significant impact.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009

XV. PUBLIC SERVICES

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Would the project				
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services?				
a. Fire protection?	☐	☐	☒	☐
b. Police protection?	☐	☐	☒	☐
c. Schools?	☐	☐	☒	☐
d. Parks?	☐	☐	☒	☐
e. Other public facilities?	☐	☐	☒	☐

Discussion:

The City of Santa Rosa provides Police Protection and Fire Protection services within City boundaries. The Police Department provides neighborhood-oriented policing services, comprising eight patrol teams and roughly 251 employees. The Police Department is located at 965 Sonoma Avenue.

The Fire Department has a staff of approximately 146 employees serving a community population of over 181,000 residents[5]. There are ten fire stations strategically located around the city. General Plan policy PSF-E-1 sets a 5-minute travel time for emergency response within the city. According to the General Plan, two new fire stations would be constructed in the future, one of which would be located at the corner of Kawana Springs Road and Franz Kafka Avenue. The Project's addition of vehicle trips to the adjacent grid street network is not expected to cause a reduction in travel speeds that would result in significant delays for emergency vehicles. A 5-minute response time is expected to be achieved due to various approach accesses and the ability of emergency response vehicles to override traffic controls.

The City's public school system is made up of eight public school districts, 33 elementary schools, 5 middle schools, five comprehensive high schools, and one continuation high school, serving an estimated 16,698 students from kindergarten through 12th grade. According to the General Plan, four new elementary schools and two new middle schools are anticipated in order to accommodate buildout.

The City's Recreation and Parks Department operates, manages, and maintains a total of 12 community parks, 52 neighborhood parks, three special purpose parks, and three trail parks. The Sonoma County Regional Parks maintains a number of regional parks and trails in the general vicinity of the Penstemon Project site. The closest of which are Taylor Mountain Regional Park, Spring Lake Regional Park, Colgan Creek Trail, and Hunter Creek Trail.

[5] *City of Santa Rosa Fire Department Strategic Plan 2016-2021, https://.srcity.org/DocumentCenter/View/3152,*

The City charges impact fees on new development such as the Proposed Project in order to offset the cost of improving or expanding City facilities. Impact fees are used to fund the construction or expansion of needed capital improvements associated with buildout of the General Plan. The City's impact fees include the Capitol Facilities Fee and School Impact Fees to finance required public facilities and service improvements.

XV(a-b)**Less than Significant Impact: Police and Fire.** The nearest fire stations (Fire Station #1 and #4) are located approximately 1.5 miles to the north on Sonoma Avenue and 1.5 miles to the northeast on Yulupa Avenue, respectively. The Project site is located within the Santa Rosa Police Beat 8 patrol area. Both police and fire service the existing development to the north, west and south of Penstemon Place.

The Project's 59 new homes will result in an incremental increase in the demand for the City's public services. The increase would be a minimal change that would not trigger the need for an expansion of services, an increase in staffing, or otherwise affect required service ratios. Increasing demands on public services were previously anticipated as part of the General Plan build out and are funded by impact fees that provide funding for the incremental expansion of services.

According to the Santa Rosa General Plan EIR, compliance with the City's General Plan goals and policies related to police services would ensure impacts would be less than significant. Revenues and taxes generated from the new development would contribute to funding for facilities and services that have been identified by the police and fire departments as needed for services in the future resulting in a less-than-significant impact to police protection services.

XV(c) **Less than Significant Impact: Schools.** The Project site is located within the Santa Rosa City High School District and the Bellevue Union Elementary District. The Project's 59 single family homes will likely generate between 40-60 new students throughout the K-12 school system[6]. The students attending public schools will be served by the closest City schools (Kawana Elementary, Herbert Slater Middle School and Montgomery High School). Pursuant to SB 50, the project applicant would be required to pay school impact fees at the time of building permit application submittal. This payment is considered full mitigation for any impacts to school services that would result from a project. Currently, the Santa Rosa City School District's development fees in the district are $1.04/square foot of new residential development. The Bellevue District collects $2.65/square foot of new residential development. Payment of the development fee would provide funding for new school construction, improvements, and expansion to existing schools as needed. Payment of the required school impact fees would ensure satisfaction of the Proposition 1A/SB 50 statutory requirements and the impact would be less than significant.

Kawana Elementary School has an enrollment of 418 students, with a student to teacher ratio of 19:1 and is currently accepting registration for new students. Herbert Slater Middle School has an enrollment of 759 students with a student to teacher ratio of 19:1. Montgomery High School has an enrollment of 1,698 students with a student to teacher ratio of 22:1. All of the Santa Rosa Schools all have residual capacity according to conversations with District representatives.

XV(d-e) **Less than Significant Impact: Parks and other Facilities.** The Project will not generate a substantial increase in demands that warrant the expansion or construction of new public park facilities as there are numerous existing parks and trails that provide recreational opportunities. While the 59 new residential units would create a slight increase in the use of surrounding parks, the existing park facilities will be sufficient to meet active and passive recreational demands of the new residents. Dauenhauer Park is the closest neighborhood park. Approximately 2.5 acres in size, it is located on Allan Way within ¼ mile of the Penstemon Place Project. The park offers picnic areas, a playground and open grass areas. The Project will also provide a fair share contribution to park development fees, as necessary, resulting in a less than significant impact. There are no other aspects of the Project that would result in adverse impacts to existing parks or necessitate additional park development or potentially impact other

[6] *Based upon the average population per household of 2.64 (2018 Census data).*

public facilities Therefore, impacts to parks and other facilities, as a result of project implementation, will be less than significant. (See also Section XV Recreation.)

Mitigation Measures:

None required.

Standard Measures:

The Project shall provide with the following City's standard measures:

- Evidence showing payment of school impact fees, in accordance with Government Code Section 65996, from the applicable school district will be provided prior to City issuance of any building permits.
- Evidence showing payment of park fees.
- Compliance with other standard conditions of approval will apply, including provision of a fire flow analysis to ensure adequate water pressure and flow rates.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Conversation with Melanie Martin, Santa Rosa City School District, May 2018
- Email from Dr. Chris Kim, Bellevue Union School District, May 2018

XVI. RECREATION

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse effect on the environment?	☐	☐	☒	☐

Discussion:

The City of Santa Rosa provides recreational opportunities, including public plazas and gathering places and neighborhood, community, citywide and special purpose parks and facilities throughout the city. The City has several parks on the east side of the City, and new parks are being developed in order to meet the needs of the community. According to the Santa Rosa General Plan, the City has a total of approximately 531 acres of neighborhood and community parks, 170 acres of undeveloped parkland, and 14 community and/or recreational facilities (as of 2008). Additionally, the City of Santa Rosa is located in close proximity to regional parks operated by the County of Sonoma and State of California including Spring Lake (Sonoma County Regional Park), Taylor Mountain Regional Park and Open Space Preserve (Sonoma County Regional Park) and Annadel (State Park), which offer a variety of passive and active recreational opportunities.

The City's General Plan identifies a parkland ratio of 3.5 acre per 1,000 residents. Based on the 2035 buildout population of 233,520 and the proposed parks facilities that will occupy 864.15 acres, the city park facilities will achieve a ratio of 3.7 acres at General Plan build-out, thereby exceeding the parks ratio standard.

XVI(a-b) **Less Than Significant impact:** The Project is a 59-unit residential project and would contribute to the need for overall park and recreational demand. The southeastern area of the City is well served by existing parks and recreational facilities. Dauenhauer Park is the closest neighborhood park. Approximately 2.5 acres in size, it is located on Allan Way within ¼ mile of the Penstemon Place Project. The park offers picnic areas, a playground and open grass areas. While the 59 new residential units would create a slight increase in the use of surrounding parks and recreational facilities, the existing recreational facilities will be sufficient to meet active and passive recreational demands of the new residents within the Project. The Project does not include the construction of recreational facilities and does not include the construction or expansion of existing recreation facilities.

It is anticipated that construction of the Project will use workers derived from the local area and will therefore not result in increased use or deterioration of existing recreational facilities or require the construction of new facilities. However, because of the current post-Tubbs Fire rebuilding effort and strain on local contractors, workers could be derived from outside the region and require the temporary relocation of workers for the Project. If workers were to temporarily relocate to the area to work on the Project, use of parks and recreational facilities will occur. The number of workers will not be expected to be greater than 30 workers and use of parks will not be expected to require expansion of or construction of new recreational facilities. Use of recreational facilities by temporary workers will also not be expected to result in the deterioration of existing recreational facilities

The Project itself will not substantially increase the use of existing neighborhood and regional parks such that any physical deterioration of the facilities occurs or is accelerated. Potential impacts to recreational facilities within the City of Santa Rosa as a result of this development have been identified and analyzed under the General Plan EIR. The General Plan EIR determined that build out within the City's Urban Growth Boundary (UGB) will have a less than significant impact on recreational facilities, and it does not recommend any mitigation measures for potential impacts to parks and recreation beyond those policies outlined in the Santa Rosa General Plan 2035. Because the project will not induce substantial population growth and is within the population growth anticipated in the General Plan, there is little expectation that it would put further pressure on recreational amenities thereby requiring construction or expansion of such facilities.

The Project will be required to pay park in-lieu fees to offset the increased demand for recreational facilities. Project impacts will be less than significant. Therefore, impacts related to the increased use, deterioration, construction or expansion of recreational facilities, are expected to be less than significant as a result of the Proposed Project.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009

XVII. TRANSPORTATION/TRAFFIC

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Conflict with a program, plan ordinance or policy addressing the circulation system including transit, roadway, bicycle and pedestrian facilities?	☐	☒	☐	☐
b. Conflict or be inconsistent with an CEQA Guidelines Section 15064.3, subdivision (b)? applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☒	☐	☐
d. Result in inadequate emergency access?	☐	☐	☒	☐

Discussion

The following impact analyses are based on a Traffic Impact Study completed by Whitlock & Weinberger Transportation, Inc. (W-Trans) in April 5, 2017. It is included with this Initial Study as Attachment B.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the p.m. peak period. This condition does not include Project-generated traffic volumes. Volume data was collected while local schools were in session.

Collision Rates

The calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in 2013 Collision Data on California State Highways, California Department of Transportation (Caltrans). Collision rate calculations are discussed in Attachment B and summarized below in Table XVII-1.

Table XVII-1: Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2011-2016)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Aston Ave/Meda Ave	4	**0.29**	0.18
2. Aston Ave/Linwood Ave	3	0.13	0.15
3. Linwood Ave/Poinsettia Ln	0	0	0.15
4. Taylor Mountain Pl/Kawana Springs Rd	0	0	0.18
5. Petaluma Hill Rd/Kawana Springs Rd	19	**0.41**	0.27

Notes: c/mve = collisions per million vehicles entering
Bold text indicates actual rates that are higher than the statewide average

The intersections of Aston Avenue/Meda Avenue and Petaluma Hills Road/Kawana Springs Road have collision rates that are slightly higher than the statewide average for similar facilities. At the Aston Avenue intersection, two of the collisions involved hitting an object in the intersection and the other two types were a sideswipe and rear-end. Given the limited number collisions, there is no clear indication of a safety issue. The higher average can be attributed to the low roadway volume and is not so high as to indicate a substantial safety concern.

The southbound approach to the Aston Avenue/Linwood Avenue intersection is currently operating unacceptably at service level F during the p.m. peak hour but the intersection overall is operating acceptably at service level A.

Table XVII-2: Existing Peak Hour Intersection Levels of Service

Study Intersection Approach	Existing Conditions			
	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. Aston Ave/Meda Ave	2.5	A	1.5	A
Northbound (Meda Ave) Approach	*12.1*	*B*	*13.4*	*B*
2. Aston Ave/Linwood Ave	6.9	A	8.8	A
Northbound (Linwood Ave) Approach	*17.8*	*C*	*28.0*	*D*
Southbound (Fairgrounds) Approach	*15.5*	*C*	*68.2*	*F*
3. Linwood Ave/Poinsettia Ln	0.5	A	0.1	A
Westbound (Private Driveway) Approach	*8.7*	*A*	*0.0*	*A*
Eastbound (Poinsettia Ln) Approach	*9.3*	*A*	*8.7*	*A*
4. Taylor Mountain Pl/Kawana Springs Rd	3.0	A	3.4	A
Southbound (Taylor Mountain Pl) Approach	*10.2*	*B*	*8.9*	*A*
5. Petaluma Hill Rd/Kawana Springs Rd	23.1	C	25.1	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in italics.

The perception a motorist has of intersection operation as represented by the Level of Service (LOS) can sometimes be at odds with the calculated values. Based on field observations at the intersection of Petaluma Hill Road/Kawana Springs, the delay experienced by many drivers may not match the existing evening LOS as indicated above. The calculations of LOS are based upon the volumes over a full hour, but motorists can encounter lower service levels and higher delays during the peak of the commute period at the beginning and ending of the typical workday while others can experience light traffic flow a little earlier or later within the same hour.

During the evening peak hour, the downstream Petaluma Hill Road/Yolanda Avenue intersection acts as the bottleneck for southbound commuters trying to avoid congestion on US 101. The Petaluma Hill Road queue from that intersection can extend north through the Kawana Springs Road intersection. Based on the counts collected, which included information on the queue, the number of southbound vehicles that were unable to enter the intersection during their respective green time was as low as one vehicle but as high as 21 vehicles; the average number of vehicles from the counts collected was 12 vehicles.

However, as the intersection operates acceptably according to City's standard when the service level is calculated based on the average traffic demand over the hour, with the initial queue included in the analysis, no improvements are recommended as the delay is deemed acceptable.

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the Sonoma County Transportation Authority's gravity demand model and translated to turning movement volumes at each of the study intersections that were available using a combination of the "Furness" method and factoring, depending on how the model was configured at each intersection. The Furness method is an iterative process that employs existing turn movement data, existing link volumes, and future link volumes to project likely turning future movement volumes at intersections.

For the intersection of Linwood Avenue/Poinsettia Lane, where segment volumes were only available for Linwood Avenue, a growth factor was determined and applied to all the turning movements. Since segments model volumes were not available for Meda Avenue but available for Linwood Avenue at Aston Avenue, the Furness method was applied to the Aston Avenue/Linwood Avenue intersection and using volume balancing and the existing counts, the future volumes were projected for the Aston Avenue/Meda Avenue intersection.

In some instances, the model projected a traffic volume decrease. Decreases are attributable to assumed infrastructure improvements and forecast changes in demographic data throughout the region. Though there are no planned future improvements at the study intersections, the planned Farmers Lane Extension would be along the east side of the Project boundary. The future Extension provides an additional north-south connection within the City and would likely change the existing traffic circulation pattern. However, in the abundance of caution, rather than assume volume decreases, existing counts were maintained as a "floor." This is a common technique (or default) used to ensure that the future projections are conservative.

Under the anticipated Future volumes, the study intersections are expected to operate acceptably with the exception of the Aston Avenue/Linwood Avenue intersection, which would be expected to operate at LOS F under anticipated volumes for the p.m. peak hour (see Table XVII-4).

Table XVII-4: Future Peak Hour Intersection Levels of Service

Study Intersection		Future Conditions			
		AM Peak		PM Peak	
	Approach	Delay	LOS	Delay	LOS
1.	Aston Ave/Meda Ave	2.6	A	2.4	A
	Northbound (Meda Ave) Approach	*13.8*	*B*	*18.0*	*A*
2.	Aston Ave/Linwood Ave	26.3	D	**52.1**	**F**
	Northbound (Linwood Ave) Approach	*63.5*	*F*	**	*F*
	Southbound (Fairgrounds) Approach	*13.6*	*B*	**	*F*
	Add NB thru-left and right-turn lane	**9.5**	**A**	**13.3**	**B**

Study Intersection	Approach	Future Conditions			
		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS
3.	Linwood Ave/Poinsettia Ln	0.5	A	0.1	A
	Westbound (Private Driveway) Approach	*8.9*	*A*	*0.0*	*A*
	Eastbound (Poinsettia Ln) Approach	*9.9*	*A*	*9.0*	*A*
4.	Taylor Mountain Pl/Kawana Springs Rd	3.3	A	1.8	A
	Southbound (Taylor Mt Pl) Approach	*15.1*	*A*	*12.1*	*B*
5.	Petaluma Hill Rd/Kawana Springs Rd	27.9	C	29.5	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in italics; ** = delay greater than 120 seconds; **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements; NB = Northbound

The intersection of Aston Avenue/Linwood Avenue is expected to operate unacceptably at service level F during the evening peak hour. In order to achieve acceptable operation, the intersection will need to modify the northbound approach to provide a separate right-turn lane. Given the width restriction of Linwood Avenue south of the intersection and the projected volumes, it is assumed that the additional lane would be a left-turn/through lane with about 50 feet of storage length. With this recommended improvement, the intersection is expected to operate acceptably overall at service level A or B. This Project will contribute to the overall reduction in LOS; however, the Project's contribution is estimated at 12.4%.

Trip Generation and Distribution

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, 9th Edition, 2012 for "Single Family Detached Housing" (ITE LU 210). "Apartment" (Land Use #220) was used to project the anticipated trips generated by the six second-unit dwellings as the description most closely matches the Project Description and daily trip generation for this land use is the most conservative of the various multiple-family dwelling categories.

The expected trip generation potential for the Proposed Project is indicated in Table XVII-5 and includes an average of 602 trips per day, including 47 trips during the a.m. peak hour and 63 during the p.m. peak hour. To be conservative, the six existing homes that will be razed to make way for the Proposed Project were not included in the analysis. These new trips represent the increase in traffic associated with the Project compared to existing volumes. Table XVII shows the proposed trip generation of those 602 trips.

Table XVII-5: 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 Housing	59 du	9.52	562	0.75	44	11	33	1.0	59	37	22
Second Dwelling Unit	6 du	6.65	40	0.51	3	1	2	0.62	4	2	2
Total			602		47	12	35		63	39	24

Note: du = dwelling unit

Table XVII-6: Trip Distribution Assumptions

Route	Percent
North to Brookwood Ave	25%
To/From US 101 North	30%
To/From US 101 South	30%
To/From South on Petaluma Hill Rd	15%
TOTAL	100%

Construction Traffic

The Project would temporarily result in an increase in truck trips through the study area due to typical construction activities associated with the single-family dwellings. Per the General Notes attached to all encroachment and building permits, construction hours are limited to 7:00 a.m., the start of the morning peak period, to 7:00 p.m., after the end of the evening peak period for traffic. The City's standard conditions of approval regarding construction noise states that construction activity and its associated noise, including trucks and employees talking, is not allowed outside standard hours of construction, specifically limited to 7:00 a.m. to 7:00 p.m. Monday through Friday, 8:00 a.m. to 6:00 p.m. Saturday, and no noise generating construction related activities on Sundays or holidays). The highest frequency of trucks into and out of the site would be during the grading process. It is anticipated that during any one morning or evening peak hour, there would be at most four truck trips, split between inbound out outbound, substantially fewer than what is expected to be generated by the Proposed Project during either peak hour

Intersection Operation

Existing plus Project Conditions

Upon the addition of Project-related traffic to the Existing volumes, the study intersections are expected to continue to operate acceptably, generally at the same levels of service. Project traffic volumes are summarized in Table XVII-7.

Table XVII-7: Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection		Existing Conditions				Existing plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
	Approach	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.	Aston Ave/Meda Ave	2.5	A	1.5	A	2.4	A	1.4	A
	Northbound (Meda Ave) Approach	*12.1*	*B*	13.4	*B*	*12.2*	*B*	*13.5*	*B*
2.	Aston Ave/Linwood Ave	6.9	A	8.8	A	7.9	A	10.9	B
	Northbound (Linwood Ave) Approach	*17.8*	*C*	*28.0*	*D*	*20.5*	*C*	*36.9*	*E*
	Southbound (Fairgrounds) Approach	*15.5*	*C*	*68.2*	*F*	*15.7*	*C*	*72.9*	*F*
3.	Linwood Ave/Poinsettia Ln	0.5	A	0.1	A	2.2	A	*2.2*	A
	Westbound (Private Driveway)	*8.7*	*A*	*0.0*	*A*	*9.3*	*A*	*9.2*	*A*
Approach		*9.3*	*A*	*8.7*	*A*	*9.4*	*A*	*8.7*	*A*
	Eastbound (Poinsettia Ln) Approach								
4.	Taylor Mountain Pl/Kawana Springs Rd	3.0	A	3.4	A	3.4	A	4.0	A
	Southbound (Taylor Mt. Pl) Approach	*10.2*	*B*	*8.9*	*A*	*10.2*	*B*	*9.0*	*A*
5.	Petaluma Hill Rd/Kawana Springs Rd	23.1	C	25.1	C	23.2	C	25.2	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in italics

The study intersections are expected to continue operating at acceptable service levels upon the addition of Project-generated traffic.

Future plus Project Conditions

Upon the addition of Project-generated traffic to the anticipated Future volumes, four of the five study intersections are expected to operate acceptably. With the improvements recommended for the intersection of Aston Avenue/Linwood Avenue to achieve acceptable operation under future volumes, the intersection is expected to operate acceptably overall upon the addition of Project-generated trips. The Future plus Project operating conditions are summarized in Table XVII-8.

Table XVII-8: Future and Future plus Project Peak Hour Levels of Service

Study Intersection		Existing Conditions				Existing plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
	Approach	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.	Aston Ave/Meda Ave	2.6	A	2.4	A	2.6	A	2.2	A
	Northbound (Meda Ave) Approach	13.8	*B*	*18.0*	*C*	*14.0*	*B*	*16.7*	*C*
2.	Aston Ave/Linwood Ave	26.3	D	**52.1**	F	34.0	D	**70.4**	F
	Northbound (Linwood Ave) Approach	*63.5*	*F*	**	*F*	*83.3*	*F*	**	*F*
	Southbound (Fairgrounds) Approach	*13.6*	*B*	**	*F*	*14.0*	*B*	**	*F*
	Add NB right-turn lane	9.5	A	13.3	B	10.0	B	16.2	C
3.	Linwood Ave/Poinsettia Ln	0.5	A	0.1	A	1.6	A	1.6	A
	WB (Private Driveway) Approach	*8.9*	*A*	*0.0*	A	*9.9*	*A*	*9.7*	*A*
	Eastbound (Poinsettia Ln) Approach	*9.9*	*A*	*9.0*	A	*10.2*	*B*	*9.0*	*A*
4.	Taylor Mountain Pl/Kawana Springs Rd	3.3	A	1.8	A	3.7	A	2.1	A
	Southbound (Taylor Mt. Pl) Approach	*15.1*	*A*	*12.1*	*B*	*15.8*	*C*	*12.2*	*B*
5.	Petaluma Hill Rd/Kawana Springs Rd	27.9	C	29.5	C	*28.2*	*C*	*29.8*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in italics; ** = delay greater than 120 seconds; **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements; NB = Northbound; WB= Westbound

Similar to existing conditions, under the future scenario with the addition of Project-related traffic volumes, average delay at the intersection of Aston Avenue/Meda Avenue would be expected to decrease during the p.m. peak hour due to the Project adding right hand turns. Again, the Project adds traffic predominantly to the through movement, which has an average delay that is lower than the average for the intersection as a whole, resulting in a slight reduction in the overall average delay.

Consideration was given to the need for all-way stop controls at the intersection of Linwood Avenue/Poinsettia Lane. While the volumes are not high enough to warrant all-way stop-control, there is limited visibility from the west leg of Poinsettia Lane to the north and south due to the on-street parking. The criteria call for at least 150 feet of visibility, but based on field measurements, there is only 90 feet to the north and 115 feet to the south.

While restricting parking would also open up sight lines, given that all-way stop controls would address the sight distance issue and also provide a measure of traffic calming for the residential neighborhood, implementation of all-way stops is recommended in lieu of restricting parking.

Transit

Santa Rosa City Bus: Santa Rosa City Bus provides fixed route bus service in Santa Rosa. There are two bus routes that have stops within the study area, specifically on Aston Avenue (approximately one-half mile from the project site), Petaluma Hill Road (nearly one mile) and west of the Petaluma Hill Road/Kawana Springs Road intersection (about one mile). Route 5 provides a 30-minute loop to destinations throughout southeast Santa Rosa from the Downtown Transit Mall, to the Sonoma County Fairgrounds, Santa Rosa Marketplace, and the Santa Rosa Town Center before returning. Route 18 is the Southeast Circulator route providing hourly loop service from the Downtown Transit Mall to the Santa Rosa Market Place, Farmers Lane Plaza, Eastside Transfer Center, and the Flamingo One Stop Shopping Center. These routes provide service on both weekdays and weekends.

Though the project site is located further from transit stops than is typically considered a "comfortable" walking distance of one-quarter mile, two bicycles can be carried on most City Bus buses so residents have the option of riding to the transit stop and then boarding a bus. Bike rack space is on a first come, first served basis. Additional bicycles are allowed at the discretion of the driver.

Dial-a-Ride Service: Santa Rosa Paratransit, a door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. Santa Rosa Paratransit is designed to serve the needs of individuals with disabilities within the Santa Rosa area.

Bicycle Facilities

Existing bicycle facilities, including bike lanes on portions of Brookwood Avenue and Kawana Springs Road, together with shared use of minor streets provide adequate access for bicyclists. Since bicycle facilities serving the Project site are adequate, this is considered a less than significant impact.

In the Project area, Class II bike lanes exist on one or both sides of Brookwood Avenue between Linwood Avenue and Kawana Springs Road and Kawana Springs Road between Brookwood Avenue and Petaluma Hill Road. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the Project study area. Table XVII-9 summarizes the existing and planned bicycle facilities in the Project vicinity, as contained in the Santa Rosa Bicycle and Pedestrian Master Plan (2010).

Table XVII-9: Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Colgan Creek Trail	I	0.6	Colgan Ave	Petaluma Hill Rd
Kawana Springs Rd	II	0.5	Petaluma Hill Rd	Brookwood Ave
Kawana Springs Rd (WB)	II	0.5	Santa Rosa Ave	Petaluma Hill Rd
Brookwood Ave	II	0.1	Kawana Springs Rd	Tokay St
Brookwood Ave (NB)	II	0.4	Tokay St	Linwood Ave
Petaluma Hill Rd	II	0.9	Barham Ave-Pressley St	Kawana Springs Rd
Aston Avenue	III	0.4	Hendley St	Brookwood Ave
Planned				
Colgan Creek Trail Ext	I	0.5	Kawana Springs Rd	City Limits
Kawana Springs Rd (EB)	II	0.5	Santa Rosa Ave	Petaluma Hill Rd
Kawana Springs Rd	II	0.3	Brookwood Ave	Future Farmers Ln
Linwood Ave	II	0.1	Aston Ave	Ext
Aston Ave	II	0.4	Hendley St	Brookwood Ave
Brookwood Ave (SB)	II	0.4	Linwood Ave	Brookwood Ave
Farmers Lane Ext	II	1.9	Bennett Valley Rd	Tokay St Yolanda Ave

Source: The Santa Rosa Bicycle and Pedestrian Master Plan, 2010

Pedestrian

Given the proximity of schools, parks, and shopping centers surrounding the site, it is reasonable to assume that some Project patrons and employees will want to walk, bicycle, and/or use transit (approximately ½ mile away) to reach the Project site.

While sidewalks generally exist on both sides of the streets in the study area, they do not exist currently along the Project frontage, but per the site plan, are proposed. Within the Project site, sidewalks are recommended along the street frontages, including the connection to existing sidewalks on Verbena Drive to the north.

Pedestrian facilities serving the Project site would be adequate upon completion of sidewalks along all street frontages as part of the Project. There are full sidewalks on all adjacent, developed frontages, resulting in a complete network near the site after completion of the Project. Therefore, this is considered a less than significant impact.

Impacts:

XVII(a) **Less Than Significant with Mitigation Incorporated. Circulation Planning/Congestion Management.** The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in Santa Rosa General Plan 2035. Standard TD-1 states that the City will try to maintain a level of service (LOS) D or better along all major corridors. While a corridor level of service is applied by the City in its analysis of the entire City as part of the environmental documentation supporting the General Plan, this type of analysis only provides relevant data when performed on segments containing numerous signalized intersections; the study area for the Project has only one signalized study intersection, making a corridor analysis infeasible. Therefore, although the City's standard does not specify criteria for intersections, for the purposes of this study a minimum operation of LOS D for the overall operation of intersections was applied. It is noted that intersections are the critical components of a transportation network, and a corridor can achieve LOS D operation even though some intersections are operating at lower service levels due to lower delays and higher service levels at other intersections along the corridor. It is therefore reasonable to expect the corridor to operate at LOS D or better if all of the intersections along it are at LOS D or better.

Under existing conditions, with and without the Project, the study intersections are expected to operate acceptably per the City's standards.

With and without the Proposed Project under future conditions, the intersection of Aston Avenue/ Linwood Avenue is expected to operate unacceptably at LOS F. By reconfiguring the northbound approach to include a left-turn/through and exclusive right-turn lane, delay for both movements would be substantially reduced, and the intersection would be expected to operate acceptably at LOS B or C. The intersection of Aston Avenue/Linwood Avenue is projected to operate at an unacceptable LOS F overall during the p.m. peak hour without the Project under anticipated Future volumes.

To achieve acceptable LOS operation at Aston Avenue/Linwood Avenue under Future volumes, the northbound approach will need to be reconfigured to include a northbound left-turn/through storage lane and a right-turn lane.

Adequate right of way to the southwest of the Linwood/Aston intersection is available and the land is owned by the City of Santa Rosa. The addition of a turn lane (approximately 50') could potential require the addition of sidewalk and relocation of a fire hydrant. Because the project does not cause the need for this improvement, and it will be needed only as a result of area-wide growth (operation remains acceptable under Existing plus Project volumes), the project is responsible for its equitable share of the cost of the improvements (along with other developments to achieve funding for the project).

XVI(b) **Less Than Significant Impact. Vehicle Miles Travelled.** CEQA Guidelines § 15064.3, subdivision (b) indicates that land use projects would have a significant impact if the project resulted in vehicle miles traveled (VMT) exceeding an applicable threshold of significance. It further notes that if existing models or methods are not available to estimate the vehicle miles traveled for the project being considered, a lead agency may analyze the project's vehicle miles traveled qualitatively.

The City has not yet adopted a policy regarding vehicle miles traveled (VMT) so the project's contribution was estimated for informational purposes. Based on the *Traffic Impact Study for the Penstemon Place,* the proposed project is expected to generate 602 daily trips. Vehicle miles traveled as a result of the project were calculated by multiplying the estimated number of daily trips and the average trip length for the Traffic Analysis Zone (TAZ) in which the project is located. Average trip lengths are published by the Sonoma County Transportation Authority (SCT) 2010 Comprehensive Transportation Plan (CTP). Based on an average trip length of 5.03 miles, the 602 daily trips would translate to a calculated daily VMT for the project of 3,028 miles. The calculated VMT of the proposed project is shown in Table XVII-10.

Table XVII-10 – VMT Summary

Unit	Number of Daily Trips	Calculated Daily VMT	
		mi/unit	Total
Single Family Residential (59 du)	562	5.03	2,826.9 miles
Apartments (9 du)	40	5.03	201.2 miles
Total			**3,028.1 miles**

As noted above, because the City of Santa Rosa has not yet established a criterion against which the project's VMT can be measured, the significance cannot be measured quantitatively. However, given the site's convenient access to pedestrian and bicycle facilities coupled with the proximity of shopping opportunities, restaurants, and schools, it is reasonable to assume that the site will have a less-than-significant impact in terms of vehicle miles traveled.

XVI(c) **Less Than Significant Impact with Mitigation Incorporated. Design Features.** To achieve adequate sight lines for safe operation of the intersection of Linwood Avenue/Poinsettia Lane, additional stop signs shall be installed to achieve all-way stop controls. Therefore, after the mitigation measures are applied, the Project would have a less-than-significant impact on emergency access.

XVI(d) **Less Than Significant Impact. Emergency Access.** The Traffic Impact Study included in Attachment B indicates that emergency access to the Project site and surrounding area would be adequately maintained, with nominal increases in average delay at intersections near the site that provide access to the site, as indicated by the operational analysis, so emergency response times would generally not be increased. There are no other changes contemplated as part of the Project that would adversely affect emergency access. Therefore, the Project would have a less-than-significant impact on emergency access.

Mitigation Measures:

TR-1: The Project shall pay its fair share contribution to the intersection improvement reducing the Project's impact to a level of less than significant. The Project's (proportional share has been calculated at 12.4% of the intersection improvement.

TR-2: The Project shall install stop signs and associated markings to convert the intersection of Linwood Avenue/Poinsettia Lane to all-way stop controls.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- W-Trans, Traffic Impact Study for the Penstemon Place, January 11, 2018
- W-Trans, Communication, December 2019

XVIII. TRIBAL CULTURAL RESOURCES

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☒	☐
b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☒	☐

Discussion:

A Cultural Resources Report evaluating the Project site was prepared by Tom Origer & Associates in October 2015. The report serves as the basis of this analysis and conclusions. The Cultural Resources Analysis is found in Attachment J of this Initial Study.

Based on the distribution of known cultural resources and their environmental settings, it was anticipated that prehistoric and/or historical archaeological sites could be found within the study area. One isolated flake made from obsidian of the Annadel source was found near a tree in the northwest portion of the study area. The specimen found was a single isolated obsidian flake. Isolated finds can contribute some information to prehistoric land use and hunting patterns. However, once their presence is documented no further work is warranted. The isolated find does not meet archaeological criteria for inclusion in the California Register, and is not a unique archaeological site; therefore, no work beyond documenting its location is warranted from an archaeological perspective. No tribe has identified the isolated flake as a Tribal Cultural Resource (TCR) as of the Cultural Resources Report preparation in the spring of 2015. The isolated find has been documented and no further investigation or protection is warranted. Preliminary notification letters sent by the consulting archaeologist are in addition to the City's obligation to consult under AB52. As the letters sent by the consulting archaeologist are not a formal consultation, there is no specific comment period; however, the majority of the letters were sent October 1, 2015 allowing 20 days for the tribes to respond. No responses were received in that period, except from the Native American Heritage Commission (NAHC).

XVII(a) **Less Than Significant impact: Eligibility for Listing as Historical Resource.** As noted above, the Cultural Resources Study prepared by Tom Origer & Associates in October 2015 included contacts to the local tribes and the Native American Heritage Commission registering their impact on the Proposed Project. These are identified in Attachment J. No responses were received to indicate that the

Project site is a culturally significant resource. The majority of the letters were sent October 1, 2015 and the report completed October 30, 2015 which would allow for 20 days in which to respond. No responses were received in that period, except from the NAHC, as noted in Attachment J.

Should a tribe wish to make the case that they comprise a TCR, it would be up to the tribe to make the case that they meet criteria and provide recommended mitigation.

The site is not listed on the California Register of Historical Places or on any local register of historical resources. The City of Santa Rosa General Plan 2035 and adopted EIR does not identify any cultural or historical resources of significance on the Project site, as described in the section on Cultural Resources and in Attachment J. Therefore, the Project impacts are unlikely. However, the potential to uncover cultural resources during construction is a possibility, therefore, the City's standard measures, discussed in Section V, Cultural, are is provided to ensure potential impacts to Tribal Resources remains less than significant.

XVII(b) **Less Than Significant Impact. Tribal Resource:** No Native American groups responded with concerns as to the site's cultural significance. Additionally, no archived research or field surveys identified any pre-historic or historic-era cultural resources. Absent any substantial evidence to support such a finding, the potential impacts to Tribal Cultural Resources is unlikely. However, given the potential to uncover human remains during construction, compliance with the State's regulations will ensure that should any remains be uncovered the impact is less than significant.

Mitigation Measures:

None required.

Standard Measures:

- Standard Measures identified in Section V of the Initial Study will ensure that, should any substantial resources be encountered, appropriate measures are in place to protect the resources.

- Pursuant to State law, promulgated in Public Resources Code 5097.98 and Health and Human Safety Code 7050.5, if human remains are encountered, excavation or disturbance of the location must be halted in the vicinity of the find, and the county coroner contacted. If the coroner determines the remains are Native American, the coroner will contact the Native American Heritage Commission. The Native American Heritage Commission will identify the person or persons believed to be most likely descended from the deceased Native American. The most likely descendent makes recommendations regarding the treatment of the remains with appropriate dignity.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Tom Origer & Associates, Cultural Resources Study, October 2015

XIX. UTILITIES AND SERVICE SYSTEMS

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which would cause effects?	☐	☐	☒	☐
b. Have sufficient water supplies available to serve project and reasonably foreseeable future development during normal, dry, and multiple dry years?	☐	☐	☒	☐
c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
d. Generate solid waste in excess of state or local standards or in excess of the capacity of local infrastructure or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e. Comply with federal, state and local management statutes and regulations related to solid waste?	☐	☐	☒	☐

Discussion:

The following summary is based upon review of the City of Santa Rosa 2035 General Plan/Final EIR, 2009, and the Preliminary Storm Water Management Plan (SWMP) prepared by Carlile-Macy in December of 2016 and reviewed by City Engineering staff. This document is included as Attachment I.

The Proposed Penstemon Place residential Project is located within an area that is experiencing urbanization. Urbanization was planned for in the Santa Rosa 2035 General Plan (which incorporated the Southeast Area Plan when the General Plan was adopted in 2009).

XVIII(a,c) **Less than Significant. Utilities**. The Penstemon Place Project was one of the projects evaluated as part of the Southeast Area Plan. Utilities and services are available through local City services, or from semiprivate service providers such as Pacific Gas & Electric, telecommunications and other providers. Utilities (sewer, water and storm drains) will be extended into the site from adjacent public streets.

Wastewater/Water: Within the City of Santa Rosa, wastewater is collected and treated at the Laguna Treatment Plant. According to the City's General Plan, wastewater treatment is generally sufficient to meet anticipated housing development needs through 2035 (City of Santa Rosa 2009). The existing water supplies, facilities and infrastructure are sufficient to meet the demands of the Project's 59 new homes without the need for expansion or new construction of water supply facilities. Water demand on-site will be limited through efficient irrigation of landscaping and water-efficient fixtures and appliances indoors, consistent with requirements established by the CALGreen, the Building Code, and the City's WELO Ordinance.

The existing water treatment system has sufficient capacity to meet the limited additional demands generated by the Project. Additionally, the Project will not require or result in the construction or expansion of new water or wastewater treatment facilities.

Stormwater: Drainage for the Project will require connection to the offsite adjacent storm drain system. The City's master drainage planning for this area of the City calls for connection to an existing storm drain line surrounding public streets with drainage to the west. Refer to Attachments I-1, Drainage Areas & Storm Drain Connections. The proposed storm drain system will convey the collected water into the existing public stormdrain system at three connection points. The first connection point is to the existing 18" stormdrain pipe that is located under Verbena Drive north of the site, the second connection point is to the existing 15" stormdrain pipe located under Linwood Avenue northwest of the site, and the third is to a 36" stormdrain pipe located under Linwood Avenue in the southwest corner of the site. Refer to Appendix I-1 for a graphic representation of the connection points. The proposed underground storm drain system is designed to contain the 10-year storm event, and streets shall be designed to provide an overflow route for the 100-year storm flows.

The Project will be responsible for construction of the onsite storm drain, connecting to the existing facilities, and payment of all fees. The Project shall design the storm drain to maintain the patterns anticipated by earlier developments to ensure that the Project does not exceed the service capacity that has already been designed into the existing system. Based on the existing storm drain, project storm water will need to drain toward Linwood Avenue and Verbena Drive. As a result, grading plans for the Proposed Project currently show all storm water draining to Linwood Avenue and north to Verbena Drive.

The Project is designed in accordance with the City's SUSMP Guidelines, and addresses the potential impact of development on storm water runoff volume using low impact development (LID) measures integrated into the overall site design. On-site LID measures proposed for the Project include roadside bioretention, vegetated swales, and other forms of onsite retention and treatment. The physical disturbance of these facilities during construction has been addressed in Section IX, Hydrology and Water Quality.

Although the Project would require the construction of new connections to off-site storm water drainage facilities and expansion of existing off-site facilities, new storm drainage and the new infrastructure would be installed to accommodate the increase in impervious surfaces that would result from the Proposed Project. The proposed LID measures and planned/proposed storm drain facilities onsite and in the Project vicinity are sufficient to accommodate any increased surface flows generated by the Project. The flow of storm water runoff would be retained and continue to be conveyed to the existing regional storm drain facilities. While the Project will increase the amount of runoff from the site, it will do so in a manner that was already considered in the design of the existing facilities, resulting in an impact that is less than significant.

XVIII(b) **Less Than Significant Impact. Water Supplies**. The Project will utilize water obtained from the City's water system to meet onsite water demands. Water would be accommodated via the installation of new water laterals that would connect the Proposed Project.

The Project will introduce an additional 59 dwelling units. As such, the Project will not generate a substantial increase in water demands. The increase in onsite water demand resulting from the

Proposed Project will remain consistent with what has been anticipated in the General Plan and the Urban Water Management Plan (UWMP). The existing entitlements for water supplies to the City are sufficient to continue to meet the needs of Santa Rosa in addition to the minimal water demands generated by the Project. Therefore, impacts due to insufficient water supplies or inadequate entitlements would be less than significant.

XVIII(d,e) **Less than Significant. Solid Waste.** The City of Santa Rosa currently contracts with Recology to provide solid waste collection and recycling. Recology collects and transports commercial and solid waste to the Central Disposal Site Transfer Station at 500 Meacham Road north of Petaluma. The Penstemon Project is expected to contribute to the generation of solid waste within the UGB. However, the amount of solid waste generated by the Project is considered minimal and is consistent with the service needs anticipated by the General Plan. The Project will be required to adhere to all regulations governing the disposal of solid waste. Construction- related waste will be reduced through the development of a construction waste management plan. Submittal of a construction waste management plan is a mandatory measure of CALGreen requirements that have been adopted by the City. The plan shall be prepared after selection of the actual building materials. CALGreen measures 4.408.1 – 4.408.4.1 stipulate the performance standards that would be addressed in the construction waste management plan.

Because the Project will not exceed local capacity and will be in compliance with City requirements, the Project will not conflict with local or state management reduction statutes and impact will be less than significant.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- Carlile-Macy, Storm Water Mitigation Plan for the Penstemon Place Project, December 2016

XX. WILDFIRE

Would the project:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Substantially impair and adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire	☐	☐	☒	☐
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☒	☐
d. Expose people or structures to significant risks including down slope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☒	☐

Discussion

The City of Santa Rosa is located within an area susceptible to wildland fires with expansive areas of chaparral, woodland, grassland, and scrub vegetation communities as well as steep slopes, and climatic conditions. The Project is located within the City's Urban Growth Boundary (UGB). Figure 12-5 from the 2035 General Plan places the Project site outside of the Very High Fire Hazard Severity Zone and the Wildland-Urban Interface Zone. The nearest Wildlife Urban Interface Zones are located north of Highway 12 at Farmers Lane (approximately 1.8 miles from the Project) and east of Summerfield Road (approximately 1.9 miles from the Project). The project site is categorized as a Non-VHFHZ by CalFire and surrounded by land designated as Non-VHFHZ on all sides.

In October 2017, the Tubbs Fire (Central LNU Complex) burned approximately 36,807 acres in the northern and eastern portions of the City. In 2019 the Kincade fire burned areas to the north of Santa Rosa. Residents were exposed to direct effects of the wildfire, such as the loss of a structure, and to the secondary effects of the wildfire, such as smoke and air pollution. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals) and gases (carbon monoxide, carbon dioxide, nitrogen oxides). Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Impacts:

XX (a) Less than Significant Impact. Emergency Response. The project site is categorized as a Non-VHFHZ by CAL FIRE, located approximately 1.8 miles from areas designated as a Very High Fire Hazard Severity Zone. The Project site is located within the UGB and will be included in the City's Emergency Operation Plan. Therefore, in the event of a wildfire the proposed project is not expected to substantially

impair an adopted emergency response plan or emergency evacuation plan, and impacts will be less than significant.

XX(b-d)Less than Significant Impact. Fire Reduction . The project site is relatively flat, with a 10 percent slope at the eastern edge of the parcel. As identified in Section VII Geology and Soils, there are no mapped landslides at the Project site. The proposed structures will require a building permit and built in compliance with the California Building Code in affect at the time of Building Permit submittal. The project will install new infrastructure, including utilities and power lines, and will not exacerbate the fire risk.

There are no other factors, such as steep slopes, prevailing winds that will exacerbate fire risk or expose project occupants to the uncontrolled spread of a wildfire, pollutant concentrations from a wildfire, post-fire slope instability, or post-fire flooding. Therefore, impacts will be less than significant.

Mitigation Measures:

None required.

Sources:

- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- CalFire, Very High Fire Hazard Severity Zones (VHFHZ) Map, accessed online December 2019

XXI. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project?				
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

Discussion:

XXI(a) **Less Than Significant with Mitigation Incorporated:** The Penstemon Project is located within the City's Urban Growth Boundary and potential impacts associated with its development have been anticipated by the City's General Plan and analyzed in the General Plan EIR. The project is consistent with the General Plan Land Use designation, goals, policies and programs. All potential impacts to biological resources have been mitigated to levels less than significant, as identified in Section IV Biological Resources. The mitigation identifies measures which offset the loss of wetlands and tree removal, as well as for the protection of nesting birds and bats to ensure no impacts result in degradation or reductions of plants or animals.

Section V assessed the potential for cultural resources at the site. There are no historically significant buildings and protective State and locally mandated measures described in Section V will ensure that any potential impacts to subsurface cultural resources related to construction are avoided.

With implementation of mitigation measures, set forth in the sections on air quality (mitigation to reduce the potential for fugitive dust and TAC's), hazards/hazardous materials (to avoid exposure to asbestos and lead based paint), noise (construction-related noise), and transportation and circulation (intersection improvements), all potentially significant impacts are all reduced to levels of less than significant. The Project's adherence to Santa Rosa's development standards, including, but not limited to, the Hillside

Development Standards, Design Review, and Conditions of Approval, will ensure the project's potential impacts on the quality of the environment would be reduced to levels of less than significant.

As such, the project will not degrade the quality of the environment, reduce habitat, or affect cultural resources. Therefore, the project will have a less than significant impact on the environment.

XXI(b) Less Than Significant with Mitigation Incorporated: CEQA Guidelines (Section 15355(a)(b)) defines cumulative impacts as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or increase in environmental impacts. The cumulative impact from several projects is the change in the environment which results from the incremental impact of the proposed project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time."

The analysis of cumulative impacts for each environmental factor can employ one of two methods to establish the effects of other past, current, and probable future projects. Projections from an adopted general plan or related planning documents or from a prior environmental document that has been adopted or certified, providing these adopted documents describe or evaluate the regional or area-wide conditions contributing to the cumulative impact. This Initial Study evaluates cumulative impacts using the General Plan EIR. As described in the analysis above, potential environmental impacts are expected to remain at, or be mitigated to, less than significant levels. The project does not increase the severity of any of the cumulatively considerable impacts from the levels identified and analyzed in the General Plan EIR.

The Project does not have the potential to create impacts which are individually limited but cumulatively considerable. The environmental effects of the Project are typical of residential developments and will all be reduced to less that significant levels through the implementation of standard conditions of approval, or through mitigation measures contained in this Initial Study/Mitigated Negative Declaration.

While increased traffic will contribute to cumulative conditions; the City has adopted circulation policies as part of its General Plan Transportation Element that regulates traffic movement and requires construction of Project improvements to ensure traffic safety. Long-term traffic impacts related to General Plan build-out (2035 scenario) and cumulative traffic conditions will be addressed by ongoing City efforts to pursue alternative transportation modes, including increased use of public transit and other Transportation Systems Management methods. Increased traffic impacts were considered in the scope of the General Plan 2035 EIR. Circulation for this project was assessed in a report prepared by W-Trans, dated January 2018 and reviewed by City staff. The Project will contribute its fair share of impact fees and implement measures thereby mitigating its contribution, as well as its cumulative contribution, to cumulatively considerable traffic and circulation impacts or to local intersections

All other potentially cumulative impacts (agricultural resources, air quality, greenhouse gases, drainage, noise, public services and utilities) are either less than significant or are also mitigated such to levels of less than significant or reduced through the City's Standard Conditions of Approval or by the implementation of development standards, such that they will not add to a cumulatively considerable impact.

XXI(c) Less Than Significant with Mitigation Incorporated: The Project does not present adverse impacts upon human beings, either directly or indirectly. The project has the potential to result in adverse impacts to humans due to air quality, biological resources, cultural resources, hazards/ hazardous materials, noise, transportation and circulation, and tribal cultural resources. With implementation of the mitigation measures set forth in this Initial Study, the project will have less than significant environmental effect that would directly or indirectly impact human beings onsite or in the project vicinity.

The project site is located in close proximity to existing sensitive receptors including existing surrounding residential uses to the north, south, and west of the project site. Kawana Elementary School and the Sonoma Academy are both within 0.5 miles of the site. With implementation of mitigation measures set forth in the Air Quality and Noise sections, construction activities associated with the development of Penstemon Place would result in short-term air quality emissions and noise levels that fall below levels of significance and would cease once construction is finished. In addition to mitigation measures set forth in this Initial Study, the project will be conditioned to achieve city standards with respect to noise, safety, and drainage. Building and improvement plans will be reviewed to ensure compliance with applicable building codes and standards. With implementation of mitigation measures, conditions of approval, and the City's development standards, the project does not present potentially significant impacts that may have an adverse effect upon human beings, either directly or indirectly. Therefore, the project will have less than significant impacts due to substantial adverse environmental effects.

Potential impacts related to hazardous materials will be mitigated to insignificant levels. The Project will be conditioned to make City standard improvements or provide mitigations with respect to roadways, storm drainage and other impacts. Building and improvement plans will be reviewed to ensure compliance with applicable building codes and standards.

Therefore, on the basis of this initial evaluation:

☐ I find that the Proposed Project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the Proposed Project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the Project have been made by or agreed to by the Project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the Proposed Project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the Proposed Project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the Proposed Project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the Proposed Project, nothing further is required

Signature: SMurray **Date:** 6/26/2020

Printed Name: Susie Murray **Title:** Senior Planner

Sources

- State of California, Surface Mining and Reclamation Act (SMARA) of 1975, updated in 1977
- BAAQMD Website and Significance Thresholds, 2011
- BAAQMD CEQA Guidelines, May 2010, updated 2011
- City of Santa Rosa 2035 General Plan/Final EIR, 2009
- City of Santa Rosa Zoning Code, 2006
- City of Santa Rosa Design Guidelines, September 2005 (updated in 2010, 2011)
- City of Santa Rosa Southeast Area Plan EIR, Resolution No. 21807, June 21, 1994
- City of Santa Rosa Climate Action Plan, adopted June 2012
- City of Santa Rosa, Water Efficient Landscape Ordinance, Ordinance 4051, adopted December 1, 2015
- Becky Duckles, ISA, Arborist's Report, Tree Inventory & Evaluation, Penstemon Place, May 2018
- Carlile-Macy, Preliminary Standard Urban Storm Water Mitigation Plan, Penstemon Place, December 2016
- Harris & Lee Environmental Sciences, LLC, Phase I Environmental Site Assessments, April 2015
- Illingworth & Rodkin, Inc., Environmental Noise Assessment Study for the Penstemon Place Project, March 29, 2017
- Illingworth & Rodkin, Community Risk Assessment (TAC), Penstemon Place, March 8, 2017
- RGH Consultants, Geotechnical Study Report, McIntosh Property Subdivision, Linwood Avenue, Santa Rosa California, November 2015
- Tom Origer & Associates, Cultural Resources Study for the McIntosh Development, October 2015
- WRA, Inc., Biological Resources Assessments, Penstemon Place Development Project, March 2017, letter dated June 6, 2017, and letter dated July 25, 2017
- WRA, Inc., Draft Jurisdictional Wetlands Delineation Report, McIntosh Property, April 2015
- W-Trans, Draft Traffic Impact Study for the Penstemon Place Project, July 2018
- W-trans, communication, December 2019.

ATTACHMENT A

MITIGATION MONITORING AND REPORTING PROGRAM

For The Penstemon Place Project

Nadin Sponamore
January 2020

Mitigation Monitoring and Reporting Program
Penstemon Place Project

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
III. AIR QUALITY					
Mitigation Measures:					
AQ-1: During any construction period ground disturbance, the applicant shall ensure that the Project contractor implement measures to control dust and exhaust. Implementation of the City's Standard construction measures along with the measures recommended by BAAQMD, both listed below would reduce the air quality impacts associated with grading and new construction to a less than significant level. The contractor shall implement the following best management practices: • All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. • Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. • Post a sign visible from the public right-of-way providing contact information for construction-related complaints. Corrective action shall be implemented within 48 hours. The Air District's phone number shall be posted on the same sign to ensure compliance with applicable regulations.	Require as condition of approval	Planning & Economic Development – Planning Division Public Works – Engineering Development Services Division	During construction, Building and/or Public Works inspectors inspect the site for compliance with required construction control measures.	Stop construction	
AQ-2: The Project shall implement the following plan, demonstrating that the off-road equipment used on-site	Require as condition of approval	Planning & Economic	During construction, Building and/or Public	Stop construction	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
to construct the Project would achieve a fleet-wide average 69 percent reduction in $PM_{2.5}$ exhaust emissions or greater. To achieve this reduction, the Project shall be required to: • Document that all mobile diesel-powered off-road equipment larger than 25 horsepower and operating on the site for more than two days continuously shall meet, at a minimum, U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent. • The construction contractor shall use other measures to minimize construction period DPM emission to reduce the predicted cancer risk below the thresholds including the use of equipment that includes CARB-certified Level 3 Diesel Particulate Filters[1] or alternatively-fueled equipment (i.e., non-diesel) to meet this requirement. • The contractor shall use added exhaust devices to reduce community risk impacts to less than significant.		Development – Planning Division Public Works – Engineering Development Services Division	Works inspectors inspect the site for compliance with required construction control measures.		
IV. BIOLOGICAL RESOURCES					
Mitigation Measures: **BIO-1:** The wetland delineation report (WRA 2015) shall be submitted to the U.S. Army Corps of Engineers for verification. A permit from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and/or California Department of Fish and Wildlife shall be required to fill the 1.41 acres of seasonal wetland and 0.05 acre of perennial wetland (1.46 acres total) in the Project Area. Impacts to seasonal and perennial wetland features will be fully mitigated at a minimum 1:1 ratio on a functions and values basis ("no net loss"); however, the final wetland mitigation requirements is determined by the regulatory agencies during the permitting process. Required no net loss mitigation ratios shall be met by creating wetlands off-site (may require a higher than 1:1 replacement to impacts ratio, as determined by agencies) or purchasing wetland	Require as a condition of approval	Applicant's Biologist's report submitted to Planning Division Planning & Economic Development – Planning Division	Prior to issuance of building or grading permits. Planner to verify compliance with mitigation requirements.	Deny issuance of a permit until mitigation is verified.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
credits (1:1 ratio) from an established and agency approved wetland mitigation bank. Permits from agencies cannot be authorized until no net loss mitigation is determined to have been fulfilled by the agencies. Ultimate mitigation ratios are determined by the resource agencies (Corps and RWQCB) through the Section 404/401 permitting process. Once applications are submitted, the mitigation requirements are determined, not prior to submitting applications. The resource agencies dictate and approve which mitigation banks the applicant can purchase credits from based on the Project service area and credit availability.					
BIO-2: The City of Santa Rosa Tree Ordinance requires that development proposals and subdivision applications preserve and protect heritage trees to the greatest extent feasible. The Project will preserve the three largest Valley Oaks, all heritage trees with diameters between 30" to 39" DBH. These trees are of good or excellent quality with expansive canopies; they are aesthetically significant to the site and represent the highest quality nesting habitat for wildlife. Four oaks along the project perimeter will be preserved but may decline due to the impact of construction within their root zone. The Project will obtain a tree removal permit from the City prior to the removal of any protected or heritage trees and will mitigate for these removals. As such, this impact would not conflict with local policies or ordinances. A tree removal permit shall be obtained from the City of Santa Rosa for any alteration, removal or relocation of any tree including heritage, protected or street tree. The City of Santa Rosa requires replacement plantings or financial contributions as a condition of approval in order to mitigate for the loss of functions provided by trees to be removed including shade, erosion control, groundwater replenishment, visual screening, and wildlife habitat. Replacement trees shall be planted in accordance with the following criteria as stated in the City's Ordinance: a. For each 6 inches or fraction thereof of the	Require as a condition of approval	Applicant's Biologist's report submitted to Planning Division Planning & Economic Development – Planning Division	Prior to issuance of building or grading permits. Planner to verify compliance with mitigation requirements.	Deny issuance of a permit until mitigation is verified.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
diameter of a tree which was approved for removal, two trees of the same genus and species as the removed tree (or another species, if approved by the City), each of a minimum 15-gallon container size, shall be planted on the project site, provided however, that an increased number of smaller size trees of the same genus and species may be planted if approved by the City, or a fewer number of such trees of a larger size if approved by the City. b. If the development site is inadequate in size to accommodate the replacement trees, the trees shall be planted on public property with the approval of the Director of the City's Recreation and Parks Department. Upon the request of the developer and the approval of the Director, the City may accept an in-lieu payment of $100.00 per 15-gallon replacement tree on condition that all such payments shall be used for tree-related educational projects and/or planting programs of the City. c. A consulting arborist shall be present during work done within their driplines to assess how many roots are encountered that must be cut. A note stating this will be printed on construction plans to alert the contractors and supervisors to schedule the arborist. If the trees are deemed by the arborist to be unstable or hazardous after that work they shall be removed and mitigated. d. Tree protection fencing shall be installed at the outer edge of the protected tree driplines prior to construction, or at the limit of required access on Linwood.					
BIO-3. Nesting Birds: The following mitigation measures shall be implemented to avoid impacts to Allen's hummingbird, Nuttall's woodpecker, and nesting birds protected by the Migratory Bird Treaty Act and California Fish and Game Code. a. If ground disturbance or vegetation removal is	Require as a condition of approval	Applicant's Biologist's report submitted to Planning Division Planning &	Prior to issuance of building or grading permits. Planner to verify compliance with mitigation requirements.	Deny issuance of a permit until mitigation is verified.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
initiated in the non-breeding season (September 1 through January 31), no pre-construction surveys for nesting birds are required and no adverse impact to birds would result. *b.* If ground disturbance or removal of vegetation occurs in the breeding bird season (February 1 through August 31), pre-construction surveys following guidelines/protocols by CDFW shall be performed by a qualified biologist, including conducting the surveys no more than 14 days prior to commencement of such activities to determine the presence and location of nesting bird species. If active nests are present, standard nesting bird avoidance measures following CDFW guidelines will be implemented, including establishment of temporary no-work buffers around active nests will prevent adverse impacts to nesting birds. Appropriate buffer distance shall be determined by a qualified biologist and is dependent on species, surrounding vegetation, and topography. Once active nests become inactive, such as when young fledge the nest or the nest is subject to predation, work may continue in the buffer area and no adverse impact to birds will result.		Economic Development – Planning Division			
BIO-4. Special-Status Bat: The following measures shall be implemented to avoid impacts to special-status bat species: a. Pre-construction roost assessment survey: A qualified biologist shall conduct a roost assessment survey of uninhabited residences located within the Project Area at least one week prior to initiation of construction. The survey will assess use of the structure for roosting as well as potential presence of bats. If the biologist finds no evidence of, or potential to support bat roosting, no further measures are recommended. If evidence of bat roosting is present, additional measures described	Require as a condition of approval	Applicant's Biologist's report submitted to Planning Division Planning & Economic Development – Planning Division	Prior to issuance of building or grading permits. Planner to verify compliance with mitigation requirements.	Deny issuance of a permit until mitigation is verified.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
below shall be implemented: 1. Work activities outside the maternity roosting season: If evidence of bat roosting is discovered during the pre-construction roost assessment and demolition is planned August 1 through mid-April (outside the bat maternity roosting season), a qualified biologist shall implement passive exclusion measures (i.e. sealing up points of ingress/egress) to prevent bats from re-entering the structures, or making the structures unsuitable to roosting (i.e. opening up the structures to excessive wind or light exposure which would limit temperature stability necessary for thermoregulation during roosting). After sufficient time to allow bats to escape and a follow-up survey to determine if bats have vacated the roost, demolition may continue and impacts to special-status bat species will be avoided. 2. Work activities during the maternity roosting season: If a pre-construction roost assessment discovers evidence of bat roosting in the uninhabited residences during the maternity roosting season (March 1 through July 31), and determines maternity roosting bats are present, demolition of maternity roost structures shall be avoided during the maternity roosting season or until a qualified biologist determines the roost has been vacated.					
IX HAZARDS AND HAZARDOUS MATERIALS	nnn				
HAZ-1: A Lead based Pain (LBP) survey shall be conducted within 6 months prior to any activities with the potential to disturb building materials to determine	Require as a condition of project approval	Planning & Economic Development-	Prior to issuance of building or grading permit, Planning to	Stop project until compliance is ensured	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
whether LBP is present. Further, in the event LBP is detected, the materials will be removed prior to any activities with the potential to disturb such materials.		Planning Division & County Environmental Health	verify for compliance that site is LBP free.		
HAZ-2: A comprehensive, pre-demolition ACM survey in accordance with the sampling protocol of the Asbestos Hazard Emergency Response Act shall be conducted within 6 months prior to any activities with the potential to disturb building materials to determine whether ACM are present. Further, in the event ACM is detected, the materials identified will be removed and disposed of prior to any activities with the potential to disturb such materials, in accordance with all applicable laws.	Require as a condition of project approval	Planning & Economic Development-Planning Division & County Environmental Health	Prior to issuance of building or grading permit, Planning to verify for compliance that site is free of asbestos.	Stop project until compliance is ensured	
XII. NOISE					
NOI-1: Mechanical Equipment. Mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's noise level requirements. A qualified acoustical consultant shall be retained to review mechanical noise as these systems are selected to determine specific noise reduction measures necessary to reduce noise levels into compliance with the Noise Ordinance, City Code Chapter 17-16. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers such as enclosures and parapet walls to block the line-of-sight between the noise source and the nearest receptors. Alternate measures may include locating equipment in less noise-sensitive areas, where feasible.	Require as condition of approval	Planning & Economic Development – Planning Division	Planning and Building to verify compliance with these conditions prior to issuance of a grading permit	Stop construction until compliance is ensured.	
NOI-2: Interior/Exterior Noise Levels. The following noise insulation features shall be incorporated into the proposed Project to reduce interior noise levels to 45 dBA DNL or less: a. Provide a suitable form of forced-air	Require as condition of approval	Planning & Economic Development – Planning Division	Planning and Building to verify compliance with these conditions prior to issuance of a grading permit	Stop construction until compliance is ensured.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
mechanical ventilation, as determined by the local building official, on the Project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards. While the first flor rooms would be mostly shielded, the upper floors would be closer in elevation to the roadway and would not receive the shielding from the fence. The forced-air mechanical ventilation would be required at the residences on Lots 35 through 46 to ensure the 45 dBA DNL interior noise level threshold is met within residences.					
b. A solid six-foot privacy fence will be constructed along the perimeter of the backyards of each residence. The 60 dBA DNL threshold for exterior use areas of single-family residences are typically applied at the center of outdoor use areas. For this reason, receptors were positioned at the center of each backyard for Lots 35 to 46 adjacent to the Farmers Lane extension, for Lots 1 through 24 and 34 along the northern perimeter, for Lots 47 through 59 near the southern perimeter, and for Lots 25 through 30 to represent the second row of homes from the Farmers Lane extension. The only backyard that exceeded 60 dBA DNL when no fence was modeled was Lot 46, and it exceeded the limit by 1 dBA. A 6-foot fence typically provides about 5 dBA of noise reduction but due to the elevation difference between the receptor and the roadway, the fence would provide a 2 dBA reduction. The resulting noise level would be 59 dBA DNL with the fence.					
c. It is recommended that the fence at the corner Lot 46 rap around to the side yard approximately 65 feet to provide maximum noise reduction. With the inclusion of acoustical shielding provided by this fence, the noise levels at the backyard of residence 46 would be less than 60 dBA DNL meeting the					

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
City's "normally acceptable" noise level threshold for private outdoor use areas in new single-family developments.					
NOI-3: **Vibration** Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy objects, within 20 feet of any adjacent residences.	Require as condition of approval	Planning & Economic Development – Planning Division	Planning and Building to verify compliance with these conditions prior to issuance of a grading permit	Stop construction until compliance is ensured.	
NOI-4: Construction Noise. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. The City shall require the contractor to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the Project vicinity. a. Construction and noise-generating activities related to construction shall be limited to 7:00 a.m. to 7:00 pm. Monday through Friday, and 8:00 a.m. to 6:00 p.m. Saturday. No noise-generating activities relating to construction are permitted on Sundays and holidays. b. Avoid overlapping construction phases (the overlapping of the construction phases increases the number of potential pieces of large equipment that could be used simultaneously, which could increase noise levels by up to 8 dBA). c. Construct temporary noise barriers, to screen stationary noise-generating equipment. Assuming a height of 10 feet, temporary noise barrier fences would provide at least 5 dBA noise reduction if the noise barrier interrupts	Require as condition of approval	Planning & Economic Development – Planning Division	Planning and Building to verify compliance with these conditions prior to issuance of a grading permit	Stop construction until compliance is ensured.	

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.					
d. Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.					
e. Unnecessary idling of internal combustion engines shall be strictly prohibited.					
f. Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.					
g. Utilize "quiet" air compressors and other stationary noise sources.					
h. Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the Project site during all Project construction.					
i. Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.					
j. Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the Project site.					
k. The contractor shall prepare a detailed					

Mitigation Measure	Implementation Procedure	Monitoring Responsibility	Monitoring/Reporting Action & Schedule	Non-Compliance Sanction/Activity	Monitoring Compliance Record (Name/Date)
construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance. l. Designate a "disturbance coordinator" who would be responsible for responding to all complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.					
XVI. TRANSPORTATION/TRAFFIC					
Mitigation Measures:					
TR-1: The Project shall pay its fair share contribution to the intersection improvement reducing the Project's impact to a level of less than significant. The Project's (proportional share has been calculated at 12.4% of the intersection improvement.	Require as condition of approval	Planning & Economic Development – Planning Division	Prior to issuance of a building permit, planning shall ensure that compliance with this mitigation has been satisfied	Delay building permit until compliance is ensured	
TR-2: The Project shall install stop signs and associated markings to convert the intersection of Linwood Avenue/Poinsettia Lane to all-way stop controls.	Require as condition of approval	Planning & Economic Development – Planning Division	Prior to issuance of a building permit, planning shall ensure that compliance with this mitigation has been satisfied	Delay building permit until compliance is ensured	

ATTACHMENT B

TRAFFIC IMPACT STUDY

For The Penstemon Place

W-Trans
January 11, 2018

Traffic Impact Study for the Penstemon Place

Prepared for the City of Santa Rosa

Submitted by
W-Trans

January 11, 2018

TRAFFIC ENGINEERING
TRANSPORTATION PLANNING
Balancing Functionality and Livability since 1995
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Executive Summary

The proposed Penstemon Place project includes 59 single-family detached dwellings, six of which would have a second unit, to be located on the large undeveloped plot of land south of Verbena Drive and east and north of Linwood Avenue. The project would be expected to generate an average of 602 trips on a daily basis, including 47 during the morning peak hour and 63 during the p.m. peak hour. The six houses existing on site but will be eliminated as part of the project, but to be conservative, no deduction was applied to the trip generation to reflect the replace of these existing units. The peak hour trips related to the construction are expected to be less than what is anticipated for the project upon its occupation.

Project impacts were evaluated at five intersections in the vicinity of the project site. Under the existing conditions and upon the addition of project trips, the intersections are expected to continue operating acceptably. Under future volumes, the Aston Avenue/Linwood Avenue intersection is projected to operate at LOS F during the p.m. peak hour without the project. It is recommended that a separate left-turn/through lane be installed on the northbound approach. With the recommended improvement, the intersection would operate acceptably without and with the project. The project applicant's proportional share of the cost of the recommended improvements is 12.4 percent, or $27,827. All other intersections are expected to operate at an acceptable level of service under future volumes.

Three access points to the site are proposed: Verbena Drive to the north, Poinsettia Lane from the east, completing the fourth leg of the intersection, and on Linwood Avenue to the south about 180 feet from Hibiscus Drive. An all-way stop-control warrant was performed for the proposed four-legged intersection of Linwood Avenue and Poinsettia Lane. Based on the warrant analysis, all-way stop control is warranted through one of the optional criteria and recommended to improve sight lines.

Facilities for pedestrians and bicyclists include sidewalks on most adjacent street and bike lanes on Brookwood Avenue and Kawana Springs Road. Access for these modes would be acceptable upon construction of sidewalks along the project street frontages. However, the proposed project does not conform to the existing geometry at the intersection of Poinsettia Lane/Linwood Avenue which has bulb-outs on each corner. To maintain conformity, it is recommended that the site plan be updated to include bulb-outs. There are currently no bus routes that service the area and the closest bus stop is 0.8 miles from the propose project site. To improve transit access, the project applicant should request bus service to the neighborhood.

Introduction

This report presents an analysis of the potential traffic impacts that would be associated with development of the Penstemon Place residential project to be located south of Verbena Drive and north and east of Linwood Avenue in the City of Santa Rosa. The traffic study was completed in accordance with the criteria established by the City, reflects a scope of work approved by City staff, and is consistent with standard traffic engineering techniques.

Prelude

The purpose of this traffic impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required in order to mitigate these impacts to a level of insignificance as defined by the City's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The proposed project would consist of 59 single family dwellings, six of which would have second detached units. Three access points are proposed for the site; one would connect to Verbena Drive to the north, another would replace the existing driveway on the east leg of the Poinsettia Lane/Linwood Avenue intersection, and the last would connect to Linwood Avenue on the south side of the project boundary about 180 feet east of Hibiscus Drive. There are currently six existing single family dwellings on-site. The project site is shown in Figure 1.

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Traffic Impact Study for the Penstemon Place Project

Figure 1 – Study Area & Lane Configurations

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Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections:

1. Aston Avenue/Meda Avenue
2. Aston Avenue/Linwood Avenue
3. Linwood Avenue/Poinsettia Lane
4. Taylor Mountain Place/Kawana Springs Road
5. Petaluma Hill Road/Kawana Springs Road

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

Study Intersections

Aston Avenue/Meda Avenue is a tee intersection with one lane on each approach. There is stop control on the south leg of Meda Avenue. There are crosswalks on the south and west legs of the intersection. The intersection is directly west of the intersection of Aston Avenue/Linwood Avenue, as described below.

Aston Avenue/Linwood Avenue is a two-way stop-controlled four-legged intersection with stop controls on the north and south legs. The north leg is one of the access points to the fairgrounds. With the exception of the north leg, which has two lanes, all other approaches have single lanes. There are crosswalks on all legs except the west leg. The intersection is directly east of the intersection of Aston Avenue/Meda Avenue.

Linwood Avenue/Poinsettia Lane is a four-legged intersection with stop controls in the east-west direction. Currently, the east leg is a private driveway. While there are no crosswalks at the intersection, there are bulb-outs on the west side.

Taylor Mountain Place/Kawana Springs Road is a stop-controlled intersection with a stop sign on the southbound Taylor Mountain Place approach. Each approach has a single lane. There are no stripped crosswalks at the intersection but there are curb ramps on the south and east sides of the intersection.

Petaluma Hill Road/Kawana Springs Road is a signalized four-legged intersection with protected-permitted left-turn phasing on each leg. There is a right-turn overlap in the southbound and eastbound directions. There are crosswalks with pedestrian phasing on the all but the south leg.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published

in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is July 1, 2011 through June 30, 2016.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2013 Collision Data on California State Highways*, California Department of Transportation (Caltrans). Three of the five intersections have collision rates that are less than the statewide average. For the intersections with rates higher than the statewide average, further review was performed, as discussed below. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2011-2016)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Aston Ave/Meda Ave	4	**0.29**	0.18
2. Aston Ave/Linwood Ave	3	0.13	0.15
3. Linwood Ave/Poinsettia Ln	0.0	0	0.15
4. Taylor Mountain Pl/Kawana Springs Rd	0	0	0.18
5. Petaluma Hill Rd/Kawana Springs Rd	19	**0.41**	0.27

Note: c/mve = collisions per million vehicles entering

The intersections of Aston Avenue/Meda Avenue and Petaluma Hills Road/Kawana Springs Road have collision rates that are slightly higher than the statewide average for similar facilities. At the Aston Avenue intersection, two of the collisions involved hitting an object in the intersection and the other two types were a sideswipe and rear-end. Given the limited number collisions, there is no clear indication of any reason for concern. The higher average can be attributed to the low roadway volume, although not perceived as a concern.

The most common types of collisions that occurred at Petaluma Hills Road/Kawana Springs Road were rear-end, broadside, and head-on, with the primary cause being right-of-way violation. While rear-end collisions are generally common for busy signalized intersections, broadside and head-on collisions are more likely associated with the permitted left-turn phasing that is present on all approaches. It is noted that more than half of the collisions at the intersection occurred where vehicles were traveling on Petaluma Hill Road. Currently the intersection is scheduled to have flashing yellow arrows provided which may reduce the average collision rate at the intersection by indicating to drivers that the left-turn is permitted and not a protected movement.

Alternative Modes

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 network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, sidewalk gaps, obstacles, and barriers can be found along some of the roadways connecting to the project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points.

- **Linwood Avenue** – Intermittent sidewalk coverage is provided on Linwood Avenue with gaps on one or both sides of the street between Aston Avenue and Taylor Mountain Place/Linwood Avenue. Sidewalks are

provided along frontages of more recently developed properties. Curb ramps exist at developed side street approaches.

- **Kawana Springs Road** – Continuous sidewalks are provided on one or both sides of Kawana Springs Road between Taylor Mountain Place and west of Petaluma Hill Road. There are no sidewalks on the north side for the length of road between Brookwood Avenue and Taylor Mountain Place. Sidewalks do not exist on the south side of the street from Meda Avenue to the west side of the Kawana Springs Road/Petaluma Hill Road intersection. There are acorn street lights on Kawana Springs Road.

- **Taylor Mountain Place** – Continuous sidewalks are provided on one side of Taylor Mountain Place between Tokay Street and Kawana Springs Road. Sidewalks do not exist on the west side of the street where the property has not been developed.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2012, classifies bikeways into three categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.

Guidance for Class IV Bikeways is provided in *Design Information Bulletin Number 89: Class IV Bikeway Guidance (Separated Bikeways/Cycle Tracks)*, Caltrans, 2015.

- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

In the project area, Class II bike lanes exist on one or both sides of Brookwood Avenue between Linwood Avenue and Kawana Springs Road and Kawana Springs Road between Brookwood Avenue and Petaluma Hill Road. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in *the Santa Rosa Bicycle and Pedestrian Master Plan* (2010).

Table 2 – Bicycle Facility Summary				
Status **Facility**	**Class**	**Length (miles)**	**Begin Point**	**End Point**
Existing				
Colgan Creek Trail	I	0.6	Colgan Ave	Petaluma Hill Rd
Kawana Springs Rd	II	0.5	Petaluma Hill Rd	Brookwood Ave
Kawana Springs Rd (WB)	II	0.5	Santa Rosa Ave	Petaluma Hill Rd
Brookwood Ave	II	0.1	Kawana Springs Rd	Tokay St
Brookwood Ave (NB)	II	0.4	Tokay St	Linwood Ave
Petaluma Hill Rd	II	0.9	Barham Ave-Pressley St	Kawana Springs Rd
Aston Avenue	III	0.4	Hendley St	Brookwood Ave
Planned				
Colgan Creek Trail Ext.	I	0.5	Kawana Springs Rd	City Limits
Kawana Springs Rd (EB)	II	0.5	Santa Rosa Ave	Petaluma Hill Rd
Kawana Springs Rd	II	0.3	Brookwood Ave	Future Famers Ln Ext.
Linwood Ave	II	0.1	Aston Ave	Brookwood Ave
Aston Avenue	II	0.4	Hendley St	Brookwood Ave
Brookwood Ave (SB)	II	0.4	Linwood Ave	Tokay St
Farmers Road Ext.	II	1.9	Bennett Valley Rd	Yolanda Ave

Source: *The Santa Rosa Bicycle and Pedestrian Master Plan*, 2010

Transit Facilities

Santa Rosa CityBus provides fixed route bus service in Santa Rosa. There are two bus routes that have stops within the study area, specifically on Aston Avenue, Petaluma Hill Road and west of the Petaluma Hill Road/Kawana Springs Road intersection. Route 5 provides a 30-minute loop to destinations throughout southeast Santa Rosa from the Downtown Transit Mall, to the Sonoma County Fairgrounds, Santa Rosa Marketplace, and the Santa Rosa Town Center before returning. Route 18 is the Southeast Circulator route providing hourly loop service from the Downtown Transit Mall to the Santa Rosa Market Place, Farmers Lane Plaza, Eastside Transfer Center, and the Flamingo One Stop Shopping Center. These routes provide service on both weekdays and weekends.

Two bicycles can be carried on most CityBus buses. Bike rack space is on a first come, first served basis. Additional bicycles are allowed at the discretion of the driver.

Santa Rosa Paratransit, a door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. Santa Rosa Paratransit is designed to serve the needs of individuals with disabilities within the Santa Rosa area.

Capacity Analysis

Intersection Level of Service Methodologies

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 intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010. 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 Levels of Service for the intersections with side-street stop controls, or those which are unsignalized and have one or two approaches stop controlled, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The study intersections that are currently controlled by a traffic signal, or may be in the future, were evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using optimized signal timing.

The ranges of delay associated with the various levels of service are indicated in Table 3.

Table 3 – Intersection Level of Service Criteria

LOS	Two-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual,* Transportation Research Board, 2010

Reporting of Peak Hour Delay

Per the City of Santa Rosa's General Plan policy T-D-1, LOS is calculated based on the average traffic demand over the hour, rather than the peak 15 minutes within the hour. This is particularly relevant in the study area, in that the average delays reported at some of the intersections over the course of an hour are not as long as what would be experienced during the peak 15 minutes during arrival and dismissal periods at the nearby school, Sonoma Academy.

Traffic Operation Standards

The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in *Santa Rosa General Plan 2035*. Standard TD-1 states that the City will try to maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting this standard are allowed where attainment would result in significant environmental degradation; where topography or environmental impacts make the improvement impossible; or where attainment would ensure loss of an area's unique character.

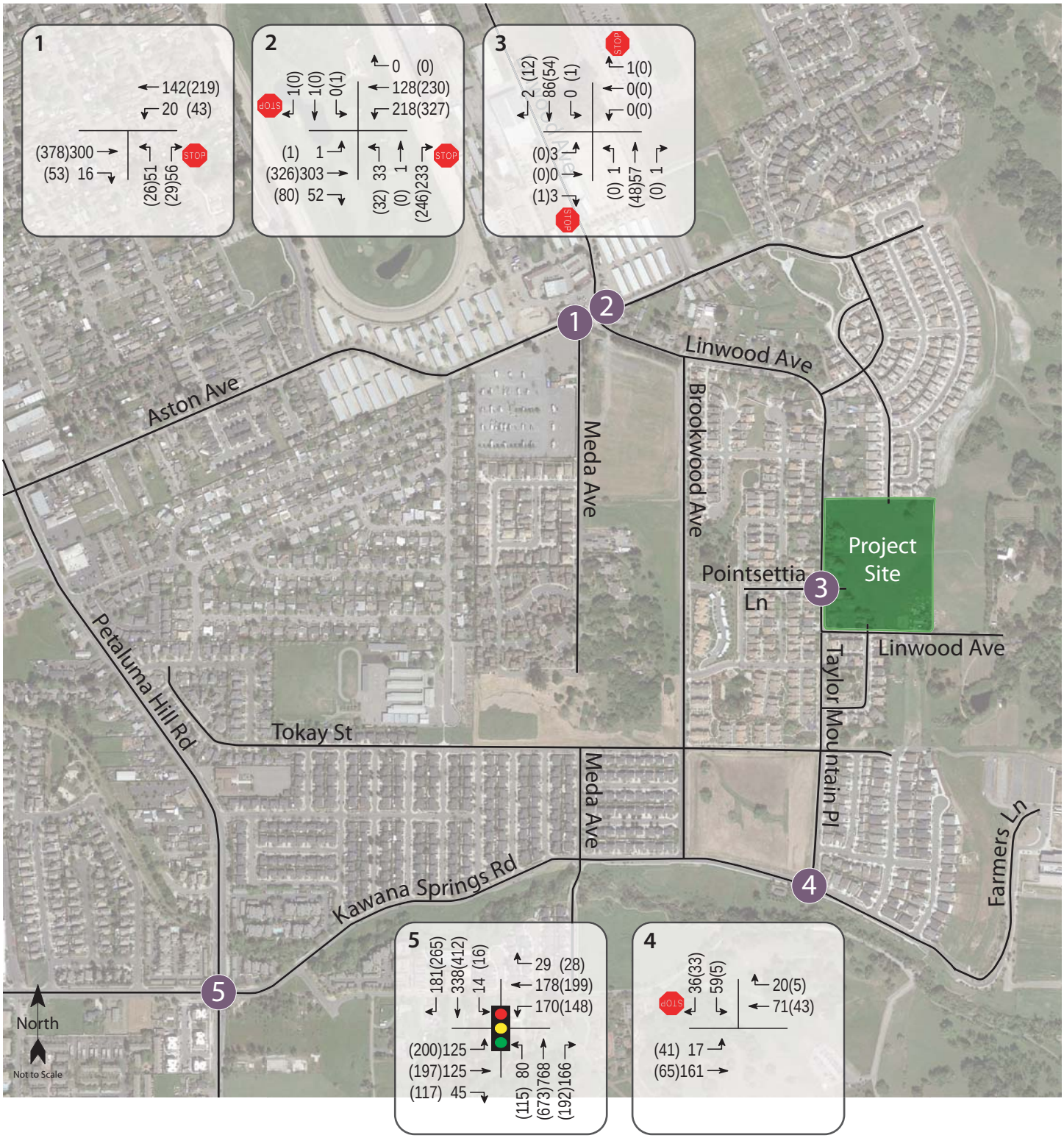
While a corridor level of service is applied by the City in its analysis of the entire City as part of the environmental documentation supporting the General Plan, this type of analysis only provides relevant data when performed on a much longer segment than the one included as the study area for the project. Therefore, although the City's standard does not specify criteria for intersections, for the purposes of this study a minimum operation of LOS D for the overall operation of signalized intersections was applied.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected when while local schools were in session.

Intersection Levels of Service

Under existing conditions, the intersections are operating acceptably overall. The existing traffic volumes are shown in Figure 2, a summary of the intersection level of service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B.



LEGEND

- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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Traffic Impact Study for the Penstemon Place Project

Figure 2 – Existing Traffic Volumes

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Table 4 – Existing Peak Hour Intersection Levels of Service				
Study Intersection	**AM Peak**		**PM Peak**	
Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. Aston Ave/Meda Ave	2.5	A	1.5	A
Northbound (Meda Ave) Approach	*12.1*	*B*	*13.4*	*B*
2. Aston Ave/Linwood Ave	*6.9*	*A*	*8.8*	*A*
Northbound (Linwood Ave) Approach	*17.8*	*C*	*28.0*	*D*
Southbound (Fairgrounds) Approach	*15.5*	*C*	*68.2*	*F*
3. Linwood Ave/Poinsettia Ln	0.5	A	0.1	A
Westbound (Private Driveway) Approach	*8.7*	*A*	*0.0*	*A*
Eastbound (Poinsettia Ln) Approach	*9.3*	*A*	*8.7*	*A*
4. Taylor Mountain Pl/Kawana Springs Rd	3.0	A	3.4	A
Southbound (Taylor Mountain Pl) Approach	*10.2*	*B*	*8.9*	*A*
5. Petaluma Hill Rd/Kawana Springs Rd	23.1	C	25.1	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

The southbound approach to the Aston Avenue/Linwood Avenue intersection is currently operating unacceptably at service level F during the p.m. peak hour but the intersection overall is operating acceptably at service level A.

Average Delay That Does Not Match Expectations

The perception a motorist has of intersection operation as represented by the Level of Service can sometimes be at odds with the calculated values. Based on field observation at the intersection of Petaluma Hill Road/Kawana Springs, the existing evening LOS determined above does not necessarily provide an accurate representation of the perceived delay. One factor that results in a difference between perception and calculated values is that the calculations are based upon a full hour. Motorists can encounter lower service levels and higher delays during the peak of the commute period at the beginning and ending of the typical workday while others can experience light traffic flow a little earlier or later within the same hour. It is therefore common for calculated average delays and associated service levels to be different from the perception some drivers have of how the intersection is operating.

During the evening peak hour, the downstream Petaluma Hill Road/Yolanda Avenue intersection acts as the bottleneck for southbound commuters trying to avoid congestion on US 101. The Petaluma Hill Road queue from that intersection can extend north through the Kawana Springs Road intersection. Based on the counts collected, which included information on the queue, the number of southbound vehicles that were unable to enter the intersection during their respective green time was as low as one vehicle but as high as 21 vehicles; the average number of vehicles from the counts collected was 12 vehicles.

Since the intersection still operates acceptably according to City's standard when the service level is calculated based on the average traffic demand over the hour, with the initial queue included in the analysis, no improvements are recommended.

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the Sonoma County Transportation Authority's gravity demand model and translated to turning movement volumes at each of the study intersections that were

available using a combination of the "Furness" method and factoring, depending on how the model was configured at each intersection. The Furness method is an iterative process that employs existing turn movement data, existing link volumes, and future link volumes to project likely turning future movement volumes at intersections.

For the intersection of Linwood Avenue/Poinsettia Lane, where segment volumes were only available for Linwood Avenue, a growth factor was determined and applied to all the turning movements. Since segments model volumes were not available for Meda Avenue but available for Linwood Avenue at Aston Avenue, the Furness method was applied to the Aston Avenue/Linwood Avenue intersection and using volume balancing and the existing counts, the future volumes were projected for the Aston Avenue/Meda Avenue intersection.

In some instances, the model projected a traffic volume decrease. Decreases are attributable to assumed infrastructure improvements and forecast changes in demographic data throughout the region. Though there are no planned future improvements at the study intersections, the planned Farmers Road extension would be along the east side of the project boundary. The extension provides an additional north-south connection within the City and would likely change the existing traffic circulation pattern. Rather than assume volume decreases, existing counts were maintained as a "floor." This is a common technique used to ensure that the future projections are conservative.

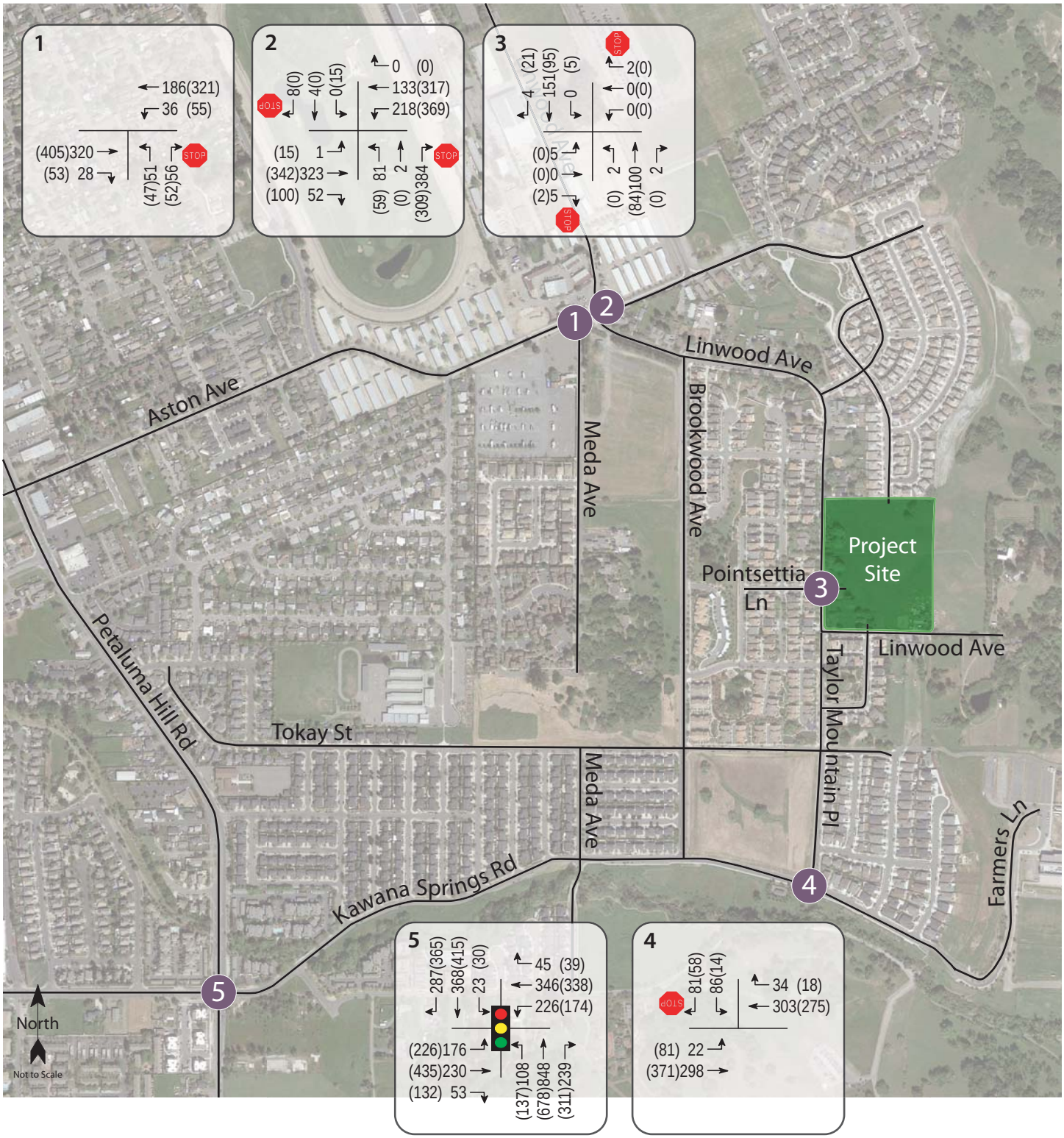
Under the anticipated Future volumes, the study intersections are expected to operate acceptably with the exception of the Aston Avenue/Linwood Avenue intersection, which would be expected to operate at LOS F under anticipated volumes for the p.m. peak hour. Future operating conditions are summarized in Table 5, and Future volumes are shown in Figure 3.

Table 5 – Future Peak Hour Intersection Levels of Service

Study Intersection	**AM Peak**		**PM Peak**	
Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. Aston Ave/Meda Ave	2.6	A	2.4	A
Northbound (Meda Ave) Approach	*13.8*	*B*	*18.0*	*C*
2. Aston Ave/Linwood Ave	26.3	D	**52.1**	**F**
Northbound (Linwood Ave) Approach	*63.5*	*F*	**	*F*
Southbound (Fairgrounds) Approach	*13.6*	*B*	**	*F*
Add NB thru-left and right-turn lane	9.5	A	13.3	B
3. Linwood Ave/Poinsettia Ln	0.5	A	0.1	A
Westbound (Private Driveway) Approach	*8.9*	*A*	*0.0*	*A*
Eastbound (Poinsettia Ln) Approach	*9.9*	*A*	*9.0*	*A*
4. Taylor Mountain Pl/Kawana Springs Rd	3.3	A	1.8	A
Southbound (Taylor Mountain Pl) Approach	*15.1*	*A*	*12.1*	*B*
5. Petaluma Hill Rd/Kawana Springs Rd	27.9	C	29.5	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* ** = delay greater than 120 seconds; **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements; NB = Northbound

The intersection of Aston Avenue/Linwood Avenue is expected to operate unacceptably at LOS F during the p.m. peak hour. It is recommended that a separate right-turn lane be added to the northbound approach. Given the width restriction of Linwood Avenue south of the intersection and the projected volumes, it is assumed that the additional lane would be a left-turn/through lane with about 50 feet of storage length. With this recommended improvement, the intersection is expected to operate acceptably overall at service level A or B.



LEGEND

- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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Traffic Impact Study for the Penstemon Place Project

Figure 3 – Future Traffic Volumes

Project Description

The project consists of 59 single-family dwellings, six of which would have second detached units. Three access points are proposed from the site. One would connect to Verbena Drive to the north, another would replace the existing driveway on the east leg of the Poinsettia Lane/Linwood Avenue intersection, and the last would connect to Linwood Avenue on the south side of the project boundary about 180 feet east of Hibiscus Drive. On the site, there are currently six existing single-family dwellings that will be torn down as part of the project. The proposed project site plan is shown in Figure 4.

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*, 9th Edition, 2012 for "Single Family Detached Housing" (ITE LU 210). "Apartment" (Land Use #220) was used to project the anticipated trips generated by the six second-unit dwellings as the description most closely matches the project description and daily trip generation for this land use is the most conservative of the various multiple-family dwelling categories.

The expected trip generation potential for the proposed project is indicated in Table 6 and includes an average of 602 trips per day, including 47 trips during the a.m. peak hour and 63 during the p.m. peak hour. To be conservative, the six existing homes that will be razed to make way for the proposed project were not included in the analysis. These new trips represent the increase in traffic associated with the project compared to existing volumes.

Table 6 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Existing											
Single Family Dwelling	59 du	9.52	562	0.75	44	11	33	1.00	59	37	22
Apartment	6 du	6.65	40	0.51	3	1	2	0.62	4	2	2
Total			**602**		**47**	**12**	**35**		**63**	**39**	**24**

Note: du = dwelling unit

Construction Traffic

The project would temporarily result in an increase in truck trips through the study area due to typical construction activities associated with the single-family dwellings. Per the City's general notes, construction hours are limited from 7 a.m., the start of the morning peak period, to 7 p.m., after the evening peak period for traffic. Generally, construction workers arrive at the site early so that work can start promptly at seven, and leave in the evening after the full time allotted. Therefore, the vehicles into and out of the site during the peak traffic periods would be trucks, though it is expected that most truck trips would happen outside of the morning and evening peak periods. It is understood that the highest frequency of trucks into and out of the site would be during the grading process. It is anticipated that during any one morning or evening peak hour, there would be most four truck trips, split between inbound out outbound, less than what is expected to be generated by the proposed project during and either peak hour.

Trip Distribution

The pattern used to allocate new project trips to the street network was determined by reviewing existing turning movement counts at the study intersections. The applied distribution assumptions and resulting trips are shown in Table 7.

Source: McIntosh Development, LLC

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Traffic Impact Study for the Penstemon Place Project

Figure 4 – Site Plan

Table 7 – Trip Distribution Assumptions	
Route	**Percent**
North to Brookwood Ave	25%
To/From US 101 North	30%
To/From US 101 South	30%
To/From South on Petaluma Hill Rd	15%
TOTAL	**100%**

Intersection Operation

Existing plus Project Conditions

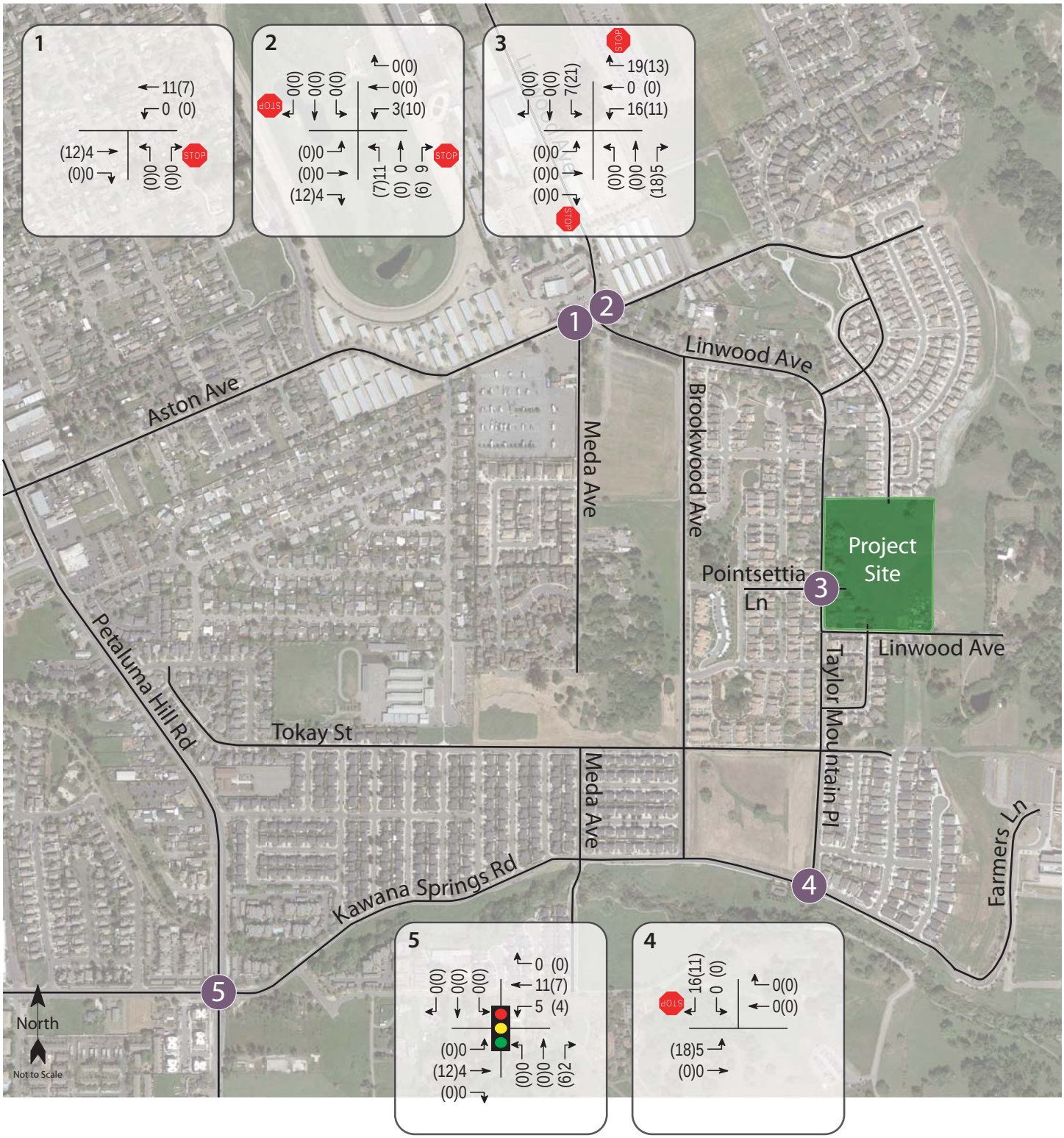
Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to continue to operate acceptably, generally at the same levels of service. Existing plus Project level of service results are summarized in Table 8, and Project traffic volumes are shown in Figure 5

Table 8 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	**Existing Conditions**				**Existing plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Aston Ave/Meda Ave	2.5	A	1.5	A	2.4	A	1.4	A
Northbound (Meda Ave) Approach	*12.1*	*B*	*13.4*	*B*	*12.2*	*B*	*13.5*	*B*
2. Aston Ave/Linwood Ave	*6.9*	*A*	*8.8*	*A*	7.9	A	10.9	B
Northbound (Linwood Ave) Approach	*17.8*	*C*	*28.0*	*D*	*20.5*	*C*	*36.9*	*E*
Southbound (Fairgrounds) Approach	*15.5*	*C*	*68.2*	*F*	*15.7*	*C*	*72.9*	*F*
3. Linwood Ave/Poinsettia Ln	0.5	A	0.1	A	2.2	A	2.2	A
Westbound (Private Driveway) Approach	*8.7*	*A*	*0.0*	*A*	*9.3*	*A*	*9.2*	*A*
Eastbound (Poinsettia Ln) Approach	*9.3*	*A*	*8.7*	*A*	*9.4*	*A*	*8.7*	*A*
4. Taylor Mountain Pl/Kawana Springs Rd	3.0	A	3.4	A	3.4	A	4.0	A
Southbound (Taylor Mountain Pl) Approach	*10.2*	*B*	*8.9*	*A*	*10.2*	*B*	*9.0*	*A*
5. Petaluma Hill Rd/Kawana Springs Rd	23.1	C	25.1	C	23.2	C	25.2	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

It should be noted that with the addition of project-related traffic volumes, average overall delay at the intersection of Aston Avenue/Meda Avenue decreases during both peak hours. While this is counter-intuitive, this condition occurs when a project adds trips to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall average delay. The project adds traffic predominantly to the through movement, which has an average delay that is lower than the average for the intersection as a whole, resulting in a slight reduction in the overall average delay. The conclusion could incorrectly be drawn that the project actually improves operation based on this data alone; however, it is more appropriate to conclude that the project trips are expected to make use of excess capacity, so drivers will experience little, if any, change in conditions as a result of the project. It is further noted that delay increases slightly on the side-street movement, which is consistent with expectation.



LEGEND

- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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Traffic Impact Study for the Penstemon Place Project

Figure 5 – Project Traffic Volumes

W-Trans

Finding – The study intersections are expected to continue operating at acceptable service levels upon the addition of project-generated traffic.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, four of the five study intersections are expected to operate acceptably. With the improvements recommended for the intersection of Aston Avenue/Linwood Avenue to achieve acceptable operation under future volumes, the intersection is expected to operate acceptably overall upon the addition of project-generated trips. The Future plus Project operating conditions are summarized in Table 9.

Table 9 – Future and Future plus Project Peak Hour Levels of Service

Study Intersection ***Approach***	**Future Conditions**				**Future plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Aston Ave/Meda Ave	2.6	A	2.4	A	2.6	A	2.2	A
Northbound (Meda Ave) Approach	*13.8*	*B*	*18.0*	*C*	14.0	B	16.7	C
2. Aston Ave/Linwood Ave	26.3	D	**52.1**	**F**	34.0	D	**70.4**	**F**
Northbound (Linwood Ave) Approach	*63.5*	*F*	**	*F*	*83.3*	*F*	**	*F*
Southbound (Fairgrounds) Approach	*13.6*	*B*	**	*F*	*14.0*	*B*	**	*F*
Add NB right-turn lane	9.5	A	13.3	*B*	*10.0*	*B*	*16.2*	*C*
3. Linwood Ave/Poinsettia Ln	0.5	A	0.1	A	*1.6*	*A*	*1.6*	*A*
Westbound (Private Driveway) Approach	*8.9*	*A*	*0.0*	*A*	*9.9*	*A*	*9.7*	*A*
Eastbound (Poinsettia Ln) Approach	*9.9*	*A*	*9.0*	*A*	*10.2*	*B*	*9.0*	*A*
4. Taylor Mountain Pl/Kawana Springs Rd	3.3	A	1.8	A	*3.7*	*A*	*2.1*	*A*
Southbound (Taylor Mountain Pl) Approach	*15.1*	*A*	*12.1*	*B*	*15.8*	*C*	*12.2*	*B*
5. Petaluma Hill Rd/Kawana Springs Rd	27.9	C	29.5	C	*28.2*	*C*	*29.8*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* ** = delay greater than 120 seconds; **Bold** text = deficient operation; Shaded cells = conditions with recommended improvements; NB = Northbound

Similar to existing conditions, under the future scenario with the addition of project-related traffic volumes, average delay at the intersection of Aston Avenue/Meda Avenue would be expected to decrease during the p.m. peak hour. Again, the project adds traffic predominantly to the through movement, which has an average delay that is lower than the average for the intersection as a whole, resulting in a slight reduction in the overall average delay.

The intersection of Aston Avenue/Linwood Avenue is projected to continue operating at an unacceptable level during the p.m. peak hour with the addition of project trips. With the recommended improvement to add a storage lane for the northbound left-turn/through movements, the intersection would operate acceptably overall.

Proportional Share

The proportional share of the improvement cost applicable to the Penstemon Place project was determined for the intersection of Aston Avenue/Linwood Avenue using the methodology published by Caltrans in their *Guide for Preparation of Traffic Impact Studies*. The equitable proportion is determined as the ratio between the number of project trips at an intersection and the expected increase in traffic between existing conditions and future

conditions. For the purpose of this analysis, the cost to widen Linwood Avenue in order to add a left turn lane was estimated to be $225,000.

Penstemon Place project's equitable share of the improvement is 12.4 percent, or $27,827. The proportional share calculations are provided in Appendix C.

Finding – Four of the five study intersections will continue operating acceptably with project traffic added. The intersection of Aston Avenue/Linwood Avenue would operate unacceptably at LOS F during the p.m. peak hour with or without the project.

Recommendation – To achieve acceptable operation under Future plus Project volumes at Aston Avenue/ Linwood Avenue, it is recommended that the northbound approach be reconfigured for a northbound left-turn/through storage lane and a right-turn lane. The project applicant should pay a proportional share of the cost to improve the intersection, calculated as $27,827.

Alternative Modes

Pedestrian Facilities

Given the proximity of schools, parks, and chopping centers surrounding the site, it is reasonable to assume that some project patrons and employees will want to walk, bicycle, and/or use transit to reach the project site.

Project Site – Sidewalks do not exist currently exist along the project frontage, but per the site plan, are proposed. Within the project site, sidewalks are recommended along the street frontages, including the connection to existing sidewalks on Verbena Drive to the north. At the intersection of Poinsettia Lane/Linwood Avenue, there are existing bulb-outs on the westerly side of the intersection but none proposed on the project site, the east side of the intersection. The proposed project should conform to the design of the existing pedestrian facilities.

Finding – Pedestrian facilities serving the project site would be inadequate upon completion of sidewalks along all street frontages as part of the project.

Recommendation – It is recommended that the proposed project's site plan be modified to include bulb-outs on east side of the Poinsettia Lane/Linwood Avenue intersection.

Bicycle Facilities

Existing bicycle facilities, including bike lanes on portions of Brookwood Avenue and Kawana Springs Road, together with shared use of minor streets provide adequate access for bicyclists.

Finding – Bicycle facilities serving the project site are adequate.

Transit

Existing transit routes are not adequate to accommodate project-generated transit trips since the existing stops are not within acceptable walking distance of the site.

Finding – Transit facilities serving the project site are not inadequate.

Recommendation – It is recommended that the applicant request that Santa Rosa CityBus add service to the neighborhood.

Access and Circulation

Site Access

As proposed there would be three access points for the project. To the north, the project would connect with the existing Verbena Drive. To the south, "Street A" would intersect Linwood Avenue about 180 feet east of the Hibiscus Drive/Linwood Avenue intersection. Along the western project boundary, access to the site would be through a newly developed east leg to the Linwood Avenue/Poinsettia Lane intersection. The intersection would have four approaches and following the existing control, would have stop-control in the east-west direction.

All-way Stop Control Warrants

All-way Stop Warrants (For Residential Streets)

Generally, warrants for all-way stop controlled intersections are based on guidelines contained in the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD). The warrants includes the following issues in considering need for all-way stop controls.

- excessive volume
- high number of collisions
- limited visibility
- excessive speeds
- crossing residential collectors
- residential frontage

An intersection meeting any one of the criteria is considered a candidate for an all-way stop sign installation.

Based on the counts collected at the intersection of Linwood Avenue/Poinsettia Lane, the volumes are not high enough to warrant all-way stop-control, even with the 80 percent reduction for the combination warrant. As mentioned in the collision history, there were no reported collisions at the intersection. A brief radar survey indicated an 85th percentile speed of 29 mph, which is less than what the warrant classifies as "excessive speeds." However, there is limited visibility from the west leg of Poinsettia Lane to the north and south due to the on-street parking. The criteria calls for at least 150 feet of visibility, but based on field measurements, there is only 90 feet to the north and 115 feet to the south.

Since one of the optional criteria, limited visibility, for an all-way stop control was satisfied, such controls are warranted. The limited visibility at the intersection is a result of the existing parking. Given that all-way stop controls would address the sight distance issue and also provide a measure of traffic calming for the residential neighborhood, implementation of all-way stops is recommended in lieu of restricting parking near the intersection to improve sight lines. A copy of the All-Way Stop-Control Warrant is provided in Appendix D.

Conclusions and Recommendations

Conclusions

- The proposed project is expected to generate an average of 602 trips per day, including 47 trips during the a.m. peak hour and 63 during the p.m. peak hour.
- Under existing conditions, with and without the project, the study intersections are expected to operate acceptably per the City's standards. The southbound approach to the intersection of Aston Avenue/Linwood Avenue operates at LOS F but the intersection as a whole operates at LOS A or B.
- With and without the proposed project under future conditions, the intersection of Aston Avenue/ Linwood Avenue is expected to operate unacceptably. By reconfiguring the northbound approach to include a left-turn/through and exclusive right-turn lane, the intersection would be expected to operate acceptably.
- Proposed pedestrian facilities, including construction of new sidewalks along all street frontages at the project site, and existing bicycle facilities are adequate.
- The transit facilities serving the site are inadequate.
- All-way stop-control is warranted at Linwood Avenue/Poinsettia Lane, with one optional criteria satisfied, and additional right-of-way controls would be appropriate given the residential setting and to address sight distance constraints.

Recommendations

- To achieve acceptable operation under Future conditions at Aston Avenue/Linwood Avenue, it is recommended that the northbound approach be reconfigured for separate northbound left-turn/through and right-turn lanes.
- The project applicant should pay its proportional share of the cost to widen Linwood Avenue at the Meda Avenue intersection, calculated as 12.4 percent, or $27,827of the estimated cost of $225,000 for the project.
- The applicant should request that Santa Rosa CityBus add service to the neighborhood.
- There is limited sight distance for eastbound vehicles on Poinsettia Avenue so installation of all-way stop-controls is recommended.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
Assistant Engineer	Briana Byrne, EIT
Graphics	Hannah Yung
Editing/Formatting	Angela McCoy

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SRO378

Appendix A

Collision Rate Calculations

Intersection Collision Rate Calculations

SRO378 McIntosh Homes Project

Intersection # 1: Aston Avenue & Meda Avenue

Date of Count: Thursday, February 23, 2017

Number of Collisions: 4
Number of Injuries: 2
Number of Fatalities: 0
ADT: 7500
Start Date: July 1, 2011
End Date: June 30, 2016
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{4 \times 1{,}000{,}000}{7{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.29 c/mve**	**0.0%**	**50.0%**
Statewide Average*	**0.18 c/mve**	**0.7%**	**36.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 2: Aston Ave & Linwood Ave

Date of Count: Thursday, February 23, 2017

Number of Collisions: 3
Number of Injuries: 1
Number of Fatalities: 0
ADT: 12400
Start Date: July 1, 2011
End Date: June 30, 2016
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{3 \times 1{,}000{,}000}{12{,}400 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.13 c/mve**	**0.0%**	**33.3%**
Statewide Average*	**0.15 c/mve**	**1.0%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

SRO378 McIntosh Homes Project

Intersection # 3: Linwood Avenue & Poinsettia Lane

Date of Count: Thursday, February 23, 2017

Number of Collisions: 0
Number of Injuries: 0
Number of Fatalities: 0
ADT: 1200
Start Date: July 1, 2011
End Date: June 30, 2016
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{0 \times 1{,}000{,}000}{1{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.00 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.15 c/mve**	**1.0%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 4: Taylor Mountain Place & Kawana Springs Road

Date of Count: Thursday, February 23, 2017

Number of Collisions: 0
Number of Injuries: 0
Number of Fatalities: 0
ADT: 1900
Start Date: July 1, 2011
End Date: June 30, 2016
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{0 \times 1{,}000{,}000}{1{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.00 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.18 c/mve**	**0.7%**	**36.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

SRO378 McIntosh Homes Project

Intersection # 5: Petaluma Hill Road & Kawana Springs Road

Date of Count: Thursday, February 23, 2017

Number of Collisions: 19
Number of Injuries: 9
Number of Fatalities: 0
ADT: 25600
Start Date: July 1, 2011
End Date: June 30, 2016
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{19 \times 1{,}000{,}000}{25{,}600 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.41 c/mve**	**0.0%**	**47.4%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

HCM 2010 TWSC
1: Meda Ave & Aston Ave

03/22/2017

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	300	16	20	142	51	56
Future Vol, veh/h	300	16	20	142	51	56
Conflicting Peds, #/hr	0	0	0	0	4	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	300	16	20	142	51	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	316	0	494	312
Stage 1	-	-	-	-	308	-
Stage 2	-	-	-	-	186	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1244	-	535	728
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	846	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1239	-	523	725
Mov Cap-2 Maneuver	-	-	-	-	523	-
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	828	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	612	-	-	1239	-
HCM Lane V/C Ratio	0.175	-	-	0.016	-
HCM Control Delay (s)	12.1	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

HCM 2010 TWSC
1: Meda Ave & Aston Ave

03/22/2017

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	378	53	43	219	26	29
Future Vol, veh/h	378	53	43	219	26	29
Conflicting Peds, #/hr	0	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	378	53	43	219	26	29

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	431	0	711	406
Stage 1	-	-	-	-	405	-
Stage 2	-	-	-	-	306	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1129	-	400	645
Stage 1	-	-	-	-	673	-
Stage 2	-	-	-	-	747	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1128	-	382	644
Mov Cap-2 Maneuver	-	-	-	-	382	-
Stage 1	-	-	-	-	673	-
Stage 2	-	-	-	-	714	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	13.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	486	-	-	1128	-
HCM Lane V/C Ratio	0.113	-	-	0.038	-
HCM Control Delay (s)	13.4	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	303	52	218	128	0	33	1	233	0	1	1
Future Vol, veh/h	1	303	52	218	128	0	33	1	233	0	1	1
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	303	52	218	128	0	33	1	233	0	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	132	0	0	359	0	0	904	903	337	1020	929	136
Stage 1	-	-	-	-	-	-	335	335	-	568	568	-
Stage 2	-	-	-	-	-	-	569	568	-	452	361	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1453	-	-	1200	-	-	258	277	705	215	268	913
Stage 1	-	-	-	-	-	-	679	643	-	508	506	-
Stage 2	-	-	-	-	-	-	507	506	-	587	626	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1447	-	-	1195	-	-	216	221	700	120	214	906
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	221	-	120	214	-
Stage 1	-	-	-	-	-	-	676	640	-	506	405	-
Stage 2	-	-	-	-	-	-	405	405	-	389	623	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.5	17.8	15.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	545	1447	-	-	1195	-	-	214	906
HCM Lane V/C Ratio	0.49	0.001	-	-	0.182	-	-	0.005	0.001
HCM Control Delay (s)	17.8	7.5	0	-	8.7	0	-	21.9	9
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	2.7	0	-	-	0.7	-	-	0	0

Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	326	80	327	230	0	32	0	246	1	0	0
Future Vol, veh/h	1	326	80	327	230	0	32	0	246	1	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	326	80	327	230	0	32	0	246	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	230	0	0	407	0	0	1254	1253	368	1376	1293	231
Stage 1	-	-	-	-	-	-	369	369	-	884	884	-
Stage 2	-	-	-	-	-	-	885	884	-	492	409	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1338	-	-	1152	-	-	149	172	677	122	163	808
Stage 1	-	-	-	-	-	-	651	621	-	340	363	-
Stage 2	-	-	-	-	-	-	340	363	-	558	596	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1337	-	-	1151	-	-	111	116	676	58	110	807
Mov Cap-2 Maneuver	-	-	-	-	-	-	111	116	-	58	110	-
Stage 1	-	-	-	-	-	-	650	620	-	340	245	-
Stage 2	-	-	-	-	-	-	229	245	-	354	595	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.5	28	68.2
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	426	1337	-	-	1151	-	-	58	-
HCM Lane V/C Ratio	0.653	0.001	-	-	0.284	-	-	0.017	-
HCM Control Delay (s)	28	7.7	0	-	9.4	0	-	68.2	0
HCM Lane LOS	D	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	4.5	0	-	-	1.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	0	3	0	0	1	1	57	1	0	86	2
Future Vol, veh/h	3	0	3	0	0	1	1	57	1	0	86	2
Conflicting Peds, #/hr	7	0	11	4	0	0	11	0	4	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	0	3	0	0	1	1	57	1	0	86	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	165	162	109	164	163	69	99	0	0	62	0	0
Stage 1	98	98	-	64	64	-	-	-	-	-	-	-
Stage 2	67	64	-	100	99	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	800	730	945	801	729	994	1494	-	-	1541	-	-
Stage 1	908	814	-	947	842	-	-	-	-	-	-	-
Stage 2	943	842	-	906	813	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	785	719	925	786	718	984	1478	-	-	1531	-	-
Mov Cap-2 Maneuver	785	719	-	786	718	-	-	-	-	-	-	-
Stage 1	898	805	-	942	838	-	-	-	-	-	-	-
Stage 2	935	838	-	894	804	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.3	8.7	0.1	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1478	-	-	849	984	1531	-	-
HCM Lane V/C Ratio	0.001	-	-	0.007	0.001	-	-	-
HCM Control Delay (s)	7.4	0	-	9.3	8.7	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	0	0	0	0	48	0	1	54	12
Future Vol, veh/h	0	0	1	0	0	0	0	48	0	1	54	12
Conflicting Peds, #/hr	8	0	9	3	0	2	9	0	3	2	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	0	0	0	0	48	0	1	54	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	127	122	78	123	128	59	75	0	0	51	0	0
Stage 1	71	71	-	51	51	-	-	-	-	-	-	-
Stage 2	56	51	-	72	77	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	846	768	983	852	763	1007	1524	-	-	1555	-	-
Stage 1	939	836	-	962	852	-	-	-	-	-	-	-
Stage 2	956	852	-	938	831	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	832	758	966	841	754	996	1511	-	-	1543	-	-
Mov Cap-2 Maneuver	832	758	-	841	754	-	-	-	-	-	-	-
Stage 1	931	828	-	959	850	-	-	-	-	-	-	-
Stage 2	949	850	-	928	823	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.7	0	0	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1511	-	-	966	-	1543	-	-
HCM Lane V/C Ratio	-	-	-	0.001	-	0.001	-	-
HCM Control Delay (s)	0	-	-	8.7	0	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-	0	-	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	161	71	20	59	36
Future Vol, veh/h	17	161	71	20	59	36
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	161	71	20	59	36

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	92	0	-	0	278	83
Stage 1	-	-	-	-	82	-
Stage 2	-	-	-	-	196	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1503	-	-	-	712	976
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	837	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1502	-	-	-	702	974
Mov Cap-2 Maneuver	-	-	-	-	702	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	826	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1502	-	-	-	785
HCM Lane V/C Ratio	0.011	-	-	-	0.121
HCM Control Delay (s)	7.4	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	65	43	5	5	33
Future Vol, veh/h	41	65	43	5	5	33
Conflicting Peds, #/hr	6	0	0	1	1	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	65	43	5	5	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	54	0	-	0	200	58
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1551	-	-	-	789	1008
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1542	-	-	-	758	997
Mov Cap-2 Maneuver	-	-	-	-	758	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	850	-

Approach	EB	WB	SB
HCM Control Delay, s	2.9	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1542	-	-	-	957
HCM Lane V/C Ratio	0.027	-	-	-	0.04
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/22/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	125	45	170	178	29	80	768	166	14	338	181
Future Volume (veh/h)	125	125	45	170	178	29	80	768	166	14	338	181
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	125	125	5	170	178	18	80	768	139	14	338	109
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	439	527	524	504	499	51	466	1446	262	287	846	818
Arrive On Green	0.07	0.28	0.28	0.08	0.30	0.30	0.05	0.48	0.48	0.02	0.45	0.45
Sat Flow, veh/h	1774	1863	1575	1774	1662	168	1774	2984	540	1774	1863	1569
Grp Volume(v), veh/h	125	125	5	170	0	196	80	455	452	14	338	109
Grp Sat Flow(s),veh/h/ln	1774	1863	1575	1774	0	1830	1774	1770	1754	1774	1863	1569
Q Serve(g_s), s	5.4	5.7	0.2	7.3	0.0	9.2	2.5	19.6	19.6	0.5	13.3	3.9
Cycle Q Clear(g_c), s	5.4	5.7	0.2	7.3	0.0	9.2	2.5	19.6	19.6	0.5	13.3	3.9
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	439	527	524	504	0	550	466	858	850	287	846	818
V/C Ratio(X)	0.28	0.24	0.01	0.34	0.00	0.36	0.17	0.53	0.53	0.05	0.40	0.13
Avail Cap(c_a), veh/h	514	527	524	548	0	550	571	858	850	446	846	818
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	30.3	24.6	23.9	0.0	30.1	14.3	19.7	19.7	16.6	20.0	13.6
Incr Delay (d2), s/veh	0.1	1.1	0.0	0.1	0.0	1.8	0.1	2.3	2.4	0.0	1.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	3.1	0.1	3.5	0.0	5.0	1.2	10.2	10.1	0.2	7.2	1.8
LnGrp Delay(d),s/veh	25.5	31.4	24.6	24.1	0.0	31.9	14.4	22.0	22.0	16.7	21.4	13.9
LnGrp LOS	C	C	C	C		C	B	C	C	B	C	B
Approach Vol, veh/h		255			366			987			461	
Approach Delay, s/veh		28.3			28.3			21.4			19.5	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.3	35.0	8.5	54.2	10.3	37.0	5.1	57.6
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	12.0	31.1	12.0	* 41	12.0	31.1	12.0	40.7
Max Q Clear Time (g_c+I1), s	9.3	7.7	4.5	15.3	7.4	11.2	2.5	21.6
Green Ext Time (p_c), s	0.1	1.9	0.0	6.0	0.1	1.8	0.0	5.6

Intersection Summary	
HCM 2010 Ctrl Delay	23.1
HCM 2010 LOS	C

Notes

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/22/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	197	117	148	199	28	115	673	192	16	412	265
Future Volume (veh/h)	200	197	117	148	199	28	115	673	192	16	412	265
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	200	197	64	148	199	24	115	673	173	16	412	138
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	497	633	626	495	522	63	326	1172	301	264	719	745
Arrive On Green	0.09	0.34	0.34	0.07	0.32	0.32	0.06	0.42	0.42	0.02	0.39	0.39
Sat Flow, veh/h	1774	1863	1574	1774	1626	196	1774	2776	713	1774	1863	1546
Grp Volume(v), veh/h	200	197	64	148	0	223	115	429	417	16	412	138
Grp Sat Flow(s),veh/h/ln	1774	1863	1574	1774	0	1822	1774	1770	1719	1774	1863	1546
Q Serve(g_s), s	7.3	7.8	2.6	5.5	0.0	9.5	3.7	18.5	18.5	0.5	17.4	5.1
Cycle Q Clear(g_c), s	7.3	7.8	2.6	5.5	0.0	9.5	3.7	18.5	18.5	0.5	17.4	5.1
Prop In Lane	1.00		1.00	1.00		0.11	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	497	633	626	495	0	585	326	747	726	264	719	745
V/C Ratio(X)	0.40	0.31	0.10	0.30	0.00	0.38	0.35	0.57	0.57	0.06	0.57	0.19
Avail Cap(c_a), veh/h	526	633	626	558	0	585	465	747	726	438	719	745
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	24.4	18.9	20.1	0.0	26.3	18.5	22.0	22.1	18.8	25.2	14.9
Incr Delay (d2), s/veh	0.2	1.3	0.3	0.1	0.0	1.9	0.2	3.2	3.3	0.0	3.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0
%ile BackOfQ(50%),veh/ln	3.5	4.2	1.2	2.7	0.0	5.1	1.8	9.6	9.4	0.3	12.2	2.3
LnGrp Delay(d),s/veh	19.6	25.6	19.2	20.3	0.0	28.2	18.8	25.2	25.4	18.9	33.2	15.4
LnGrp LOS	B	C	B	C		C	B	C	C	B	C	B
Approach Vol, veh/h		461			371			961			566	
Approach Delay, s/veh		22.1			25.0			24.5			28.5	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.4	37.9	8.8	42.9	12.3	36.0	5.2	46.5
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	11.0	32.1	12.0	* 31	11.0	32.1	12.0	30.7
Max Q Clear Time (g_c+I1), s	7.5	9.8	5.7	19.4	9.3	11.5	2.5	20.5
Green Ext Time (p_c), s	0.1	2.7	0.1	4.6	0.1	2.6	0.0	4.3

Intersection Summary	
HCM 2010 Ctrl Delay	25.1
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	320	28	36	186	51	56
Future Vol, veh/h	320	28	36	186	51	56
Conflicting Peds, #/hr	0	0	0	0	4	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	320	28	36	186	51	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	348	0	596	338
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	262	-
Critical Hdwy	-	-	4.12	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1211	-	415	704
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	743	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1206	-	403	701
Mov Cap-2 Maneuver	-	-	-	-	403	-
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	716	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	518	-	-	1206	-
HCM Lane V/C Ratio	0.207	-	-	0.03	-
HCM Control Delay (s)	13.8	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	405	53	55	321	47	52
Future Vol, veh/h	405	53	55	321	47	52
Conflicting Peds, #/hr	0	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	405	53	55	321	47	52

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	458	0	864	433
Stage 1	-	-	-	-	432	-
Stage 2	-	-	-	-	432	-
Critical Hdwy	-	-	4.12	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1103	-	274	623
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	602	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1102	-	261	622
Mov Cap-2 Maneuver	-	-	-	-	261	-
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	565	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	18
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	375	-	-	1102	-
HCM Lane V/C Ratio	0.264	-	-	0.05	-
HCM Control Delay (s)	18	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.2	-

Intersection	
Int Delay, s/veh	26.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	323	52	218	133	0	81	2	384	0	4	8
Future Vol, veh/h	1	323	52	218	133	0	81	2	384	0	4	8
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	323	52	218	133	0	81	2	384	0	4	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	137	0	0	379	0	0	930	928	357	1121	954	141
Stage 1	-	-	-	-	-	-	355	355	-	573	573	-
Stage 2	-	-	-	-	-	-	575	573	-	548	381	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1447	-	-	1179	-	-	248	268	687	183	259	907
Stage 1	-	-	-	-	-	-	662	630	-	505	504	-
Stage 2	-	-	-	-	-	-	503	504	-	521	613	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1441	-	-	1175	-	-	203	213	682	67	205	900
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	213	-	67	205	-
Stage 1	-	-	-	-	-	-	659	627	-	503	402	-
Stage 2	-	-	-	-	-	-	393	402	-	226	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.4	63.5	13.6
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	481	1441	-	-	1175	-	-	205	900
HCM Lane V/C Ratio	0.971	0.001	-	-	0.186	-	-	0.02	0.009
HCM Control Delay (s)	63.5	7.5	0	-	8.8	0	-	22.9	9
HCM Lane LOS	F	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	12.4	0	-	-	0.7	-	-	0.1	0

Intersection	
Int Delay, s/veh	52.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	342	100	369	317	0	59	0	309	15	0	0
Future Vol, veh/h	15	342	100	369	317	0	59	0	309	15	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	342	100	369	317	0	59	0	309	15	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	317	0	0	443	0	0	1479	1478	394	1633	1528	318
Stage 1	-	-	-	-	-	-	423	423	-	1055	1055	-
Stage 2	-	-	-	-	-	-	1056	1055	-	578	473	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1243	-	-	1117	-	-	104	126	655	81	117	723
Stage 1	-	-	-	-	-	-	609	588	-	273	302	-
Stage 2	-	-	-	-	-	-	272	302	-	501	558	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1242	-	-	1116	-	-	71	74	654	29	69	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	74	-	29	69	-
Stage 1	-	-	-	-	-	-	599	578	-	269	181	-
Stage 2	-	-	-	-	-	-	163	181	-	260	549	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	5.3	196.9	222.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	282	1242	-	-	1116	-	-	29	-
HCM Lane V/C Ratio	1.305	0.012	-	-	0.331	-	-	0.517	-
HCM Control Delay (s)	196.9	7.9	0	-	9.8	0	-	222.2	0
HCM Lane LOS	F	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	18.3	0	-	-	1.5	-	-	1.7	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	323	52	218	133	0	81	2	384	0	4	8
Future Vol, veh/h	1	323	52	218	133	0	81	2	384	0	4	8
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	0	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	323	52	218	133	0	81	2	384	0	4	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	137	0	0	379	0	0	930	928	357	929	954	141
Stage 1	-	-	-	-	-	-	355	355	-	573	573	-
Stage 2	-	-	-	-	-	-	575	573	-	356	381	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1447	-	-	1179	-	-	248	268	687	248	259	907
Stage 1	-	-	-	-	-	-	662	630	-	505	504	-
Stage 2	-	-	-	-	-	-	503	504	-	661	613	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1441	-	-	1175	-	-	203	213	682	90	205	900
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	213	-	90	205	-
Stage 1	-	-	-	-	-	-	659	627	-	503	402	-
Stage 2	-	-	-	-	-	-	393	402	-	287	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.4	20	13.6
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	203	682	1441	-	-	1175	-	-	205	900
HCM Lane V/C Ratio	0.409	0.563	0.001	-	-	0.186	-	-	0.02	0.009
HCM Control Delay (s)	34.5	16.9	7.5	0	-	8.8	0	-	22.9	9
HCM Lane LOS	D	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	1.8	3.5	0	-	-	0.7	-	-	0.1	0

Intersection	
Int Delay, s/veh	13.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	342	100	369	317	0	59	0	309	15	0	0
Future Vol, veh/h	15	342	100	369	317	0	59	0	309	15	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	0	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	342	100	369	317	0	59	0	309	15	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	317	0	0	443	0	0	1479	1478	394	1478	1528	318
Stage 1	-	-	-	-	-	-	423	423	-	1055	1055	-
Stage 2	-	-	-	-	-	-	1056	1055	-	423	473	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1243	-	-	1117	-	-	104	126	655	104	117	723
Stage 1	-	-	-	-	-	-	609	588	-	273	302	-
Stage 2	-	-	-	-	-	-	272	302	-	609	558	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1242	-	-	1116	-	-	71	74	654	37	69	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	74	-	37	69	-
Stage 1	-	-	-	-	-	-	599	578	-	269	181	-
Stage 2	-	-	-	-	-	-	163	181	-	316	549	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	5.3	38.6	157.3
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	71	654	1242	-	-	1116	-	-	37	-
HCM Lane V/C Ratio	0.831	0.472	0.012	-	-	0.331	-	-	0.405	-
HCM Control Delay (s)	160.5	15.3	7.9	0	-	9.8	0	-	157.3	0
HCM Lane LOS	F	C	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	4	2.5	0	-	-	1.5	-	-	1.4	-

Intersection												
Int Delay, s/veh	0.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	0	5	0	0	2	2	100	2	0	151	4
Future Vol, veh/h	5	0	5	0	0	2	2	100	2	0	151	4
Conflicting Peds, #/hr	7	0	11	4	0	0	11	0	4	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	0	5	0	0	2	2	100	2	0	151	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	277	274	175	276	275	112	166	0	0	106	0	0
Stage 1	164	164	-	109	109	-	-	-	-	-	-	-
Stage 2	113	110	-	167	166	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	675	633	868	676	632	941	1412	-	-	1485	-	-
Stage 1	838	762	-	896	805	-	-	-	-	-	-	-
Stage 2	892	804	-	835	761	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	661	623	850	661	622	931	1397	-	-	1475	-	-
Mov Cap-2 Maneuver	661	623	-	661	622	-	-	-	-	-	-	-
Stage 1	828	754	-	891	800	-	-	-	-	-	-	-
Stage 2	882	799	-	821	753	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.9	8.9	0.1	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1397	-	-	744	931	1475	-	-
HCM Lane V/C Ratio	0.001	-	-	0.013	0.002	-	-	-
HCM Control Delay (s)	7.6	0	-	9.9	8.9	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection												
Int Delay, s/veh	0.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	2	0	0	0	0	84	0	2	95	21
Future Vol, veh/h	0	0	2	0	0	0	0	84	0	2	95	21
Conflicting Peds, #/hr	8	0	9	3	0	2	9	0	3	2	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	2	0	0	0	0	84	0	2	95	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	211	206	124	207	216	95	125	0	0	87	0	0
Stage 1	119	119	-	87	87	-	-	-	-	-	-	-
Stage 2	92	87	-	120	129	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	746	691	927	751	682	962	1462	-	-	1509	-	-
Stage 1	885	797	-	921	823	-	-	-	-	-	-	-
Stage 2	915	823	-	884	789	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	733	682	911	740	674	952	1449	-	-	1498	-	-
Mov Cap-2 Maneuver	733	682	-	740	674	-	-	-	-	-	-	-
Stage 1	877	789	-	918	821	-	-	-	-	-	-	-
Stage 2	908	821	-	874	781	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	0	0	0.1
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1449	-	-	911	-	1498	-	-
HCM Lane V/C Ratio	-	-	-	0.002	-	0.001	-	-
HCM Control Delay (s)	0	-	-	9	0	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-	0	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	298	303	34	86	81
Future Vol, veh/h	22	298	303	34	86	81
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	298	303	34	86	81

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	338	0	-	0	664	322
Stage 1	-	-	-	-	321	-
Stage 2	-	-	-	-	343	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1221	-	-	-	426	719
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1220	-	-	-	416	718
Mov Cap-2 Maneuver	-	-	-	-	416	-
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	703	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	15.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1220	-	-	-	523
HCM Lane V/C Ratio	0.018	-	-	-	0.319
HCM Control Delay (s)	8	0	-	-	15.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.4

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	81	371	275	18	14	58
Future Vol, veh/h	81	371	275	18	14	58
Conflicting Peds, #/hr	6	0	0	1	1	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	81	371	275	18	14	58

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	299	0	-	0	824	296
Stage 1	-	-	-	-	290	-
Stage 2	-	-	-	-	534	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1262	-	-	-	343	743
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1255	-	-	-	312	735
Mov Cap-2 Maneuver	-	-	-	-	312	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	537	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1255	-	-	-	582
HCM Lane V/C Ratio	0.065	-	-	-	0.124
HCM Control Delay (s)	8.1	0	-	-	12.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.4

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/23/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	176	230	53	226	346	45	108	848	239	23	368	287
Future Volume (veh/h)	176	230	53	226	346	45	108	848	239	23	368	287
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	176	230	13	226	346	34	108	848	212	23	368	215
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	339	527	528	459	502	49	398	1270	317	229	800	813
Arrive On Green	0.09	0.28	0.28	0.11	0.30	0.30	0.05	0.45	0.45	0.03	0.43	0.43
Sat Flow, veh/h	1774	1863	1575	1774	1667	164	1774	2794	698	1774	1863	1569
Grp Volume(v), veh/h	176	230	13	226	0	380	108	537	523	23	368	215
Grp Sat Flow(s),veh/h/ln	1774	1863	1575	1774	0	1830	1774	1770	1722	1774	1863	1569
Q Serve(g_s), s	7.6	11.1	0.6	9.7	0.0	20.1	3.6	26.1	26.2	0.8	15.4	8.4
Cycle Q Clear(g_c), s	7.6	11.1	0.6	9.7	0.0	20.1	3.6	26.1	26.2	0.8	15.4	8.4
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	339	527	528	459	0	551	398	804	783	229	800	813
V/C Ratio(X)	0.52	0.44	0.02	0.49	0.00	0.69	0.27	0.67	0.67	0.10	0.46	0.26
Avail Cap(c_a), veh/h	377	527	528	464	0	551	498	804	783	374	800	813
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.0	32.3	24.5	23.7	0.0	33.9	16.3	23.5	23.5	19.0	22.3	14.9
Incr Delay (d2), s/veh	0.5	2.6	0.1	0.3	0.0	6.9	0.1	4.4	4.5	0.1	1.9	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	6.1	0.3	4.7	0.0	11.2	1.7	13.7	13.3	0.4	8.4	3.8
LnGrp Delay(d),s/veh	26.5	34.9	24.6	24.0	0.0	40.8	16.4	27.9	28.0	19.1	24.2	15.7
LnGrp LOS	C	C	C	C		D	B	C	C	B	C	B
Approach Vol, veh/h		419			606			1168			606	
Approach Delay, s/veh		31.0			34.5			26.9			21.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	35.0	8.8	51.6	12.6	37.0	6.0	54.3
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	12.0	31.1	12.0	* 41	12.0	31.1	12.0	40.7
Max Q Clear Time (g_c+I1), s	11.7	13.1	5.6	17.4	9.6	22.1	2.8	28.2
Green Ext Time (p_c), s	0.0	3.6	0.1	7.4	0.1	2.5	0.0	5.7

Intersection Summary	
HCM 2010 Ctrl Delay	27.9
HCM 2010 LOS	C

Notes

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/23/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	435	132	174	338	39	137	678	311	30	415	365
Future Volume (veh/h)	226	435	132	174	338	39	137	678	311	30	415	365
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	226	435	79	174	338	35	137	678	292	30	415	238
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	402	632	637	344	531	55	307	958	412	226	687	733
Arrive On Green	0.10	0.34	0.34	0.08	0.32	0.32	0.06	0.40	0.40	0.03	0.37	0.37
Sat Flow, veh/h	1774	1863	1574	1774	1656	171	1774	2394	1031	1774	1863	1545
Grp Volume(v), veh/h	226	435	79	174	0	373	137	501	469	30	415	238
Grp Sat Flow(s),veh/h/ln	1774	1863	1574	1774	0	1827	1774	1770	1655	1774	1863	1545
Q Serve(g_s), s	8.3	20.1	3.1	6.5	0.0	17.4	4.6	23.7	23.7	1.0	18.1	9.6
Cycle Q Clear(g_c), s	8.3	20.1	3.1	6.5	0.0	17.4	4.6	23.7	23.7	1.0	18.1	9.6
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.62	1.00		1.00
Lane Grp Cap(c), veh/h	402	632	637	344	0	586	307	708	662	226	687	733
V/C Ratio(X)	0.56	0.69	0.12	0.51	0.00	0.64	0.45	0.71	0.71	0.13	0.60	0.32
Avail Cap(c_a), veh/h	414	632	637	389	0	586	431	708	662	379	687	733
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	28.5	18.7	21.7	0.0	29.0	19.5	25.1	25.1	20.4	26.7	16.5
Incr Delay (d2), s/veh	0.9	6.0	0.4	0.4	0.0	5.2	0.4	5.9	6.3	0.1	3.9	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0
%ile BackOfQ(50%),veh/ln	4.1	11.3	1.4	3.1	0.0	9.7	2.2	12.7	12.0	0.5	12.7	4.3
LnGrp Delay(d),s/veh	21.6	34.5	19.1	22.1	0.0	34.2	19.9	31.0	31.4	20.5	36.1	17.7
LnGrp LOS	C	C	B	C		C	B	C	C	C	D	B
Approach Vol, veh/h		740			547			1107			683	
Approach Delay, s/veh		28.9			30.3			29.8			29.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.5	37.8	9.5	41.2	13.3	36.0	6.4	44.3
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	11.0	32.1	12.0	* 31	11.0	32.1	12.0	30.7
Max Q Clear Time (g_c+I1), s	8.5	22.1	6.6	20.1	10.3	19.4	3.0	25.7
Green Ext Time (p_c), s	0.1	3.8	0.1	5.2	0.0	4.4	0.0	3.0

Intersection Summary	
HCM 2010 Ctrl Delay	29.5
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	304	16	20	153	51	56
Future Vol, veh/h	304	16	20	153	51	56
Conflicting Peds, #/hr	0	0	0	0	4	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	304	16	20	153	51	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	320	0	509	316
Stage 1	-	-	-	-	312	-
Stage 2	-	-	-	-	197	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1240	-	524	724
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	836	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	513	721
Mov Cap-2 Maneuver	-	-	-	-	513	-
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	12.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	604	-	-	1235	-
HCM Lane V/C Ratio	0.177	-	-	0.016	-
HCM Control Delay (s)	12.2	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	390	53	43	226	26	29
Future Vol, veh/h	390	53	43	226	26	29
Conflicting Peds, #/hr	0	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	390	53	43	226	26	29

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	443	0	730	418
Stage 1	-	-	-	-	417	-
Stage 2	-	-	-	-	313	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1117	-	389	635
Stage 1	-	-	-	-	665	-
Stage 2	-	-	-	-	741	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1116	-	372	634
Mov Cap-2 Maneuver	-	-	-	-	372	-
Stage 1	-	-	-	-	665	-
Stage 2	-	-	-	-	708	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	476	-	-	1116	-
HCM Lane V/C Ratio	0.116	-	-	0.039	-
HCM Control Delay (s)	13.5	-	-	8.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	303	56	221	128	0	44	1	242	0	1	1
Future Vol, veh/h	1	303	56	221	128	0	44	1	242	0	1	1
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	303	56	221	128	0	44	1	242	0	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	132	0	0	363	0	0	912	911	339	1033	939	136
Stage 1	-	-	-	-	-	-	337	337	-	574	574	-
Stage 2	-	-	-	-	-	-	575	574	-	459	365	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1453	-	-	1196	-	-	255	274	703	211	264	913
Stage 1	-	-	-	-	-	-	677	641	-	504	503	-
Stage 2	-	-	-	-	-	-	503	503	-	582	623	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1447	-	-	1191	-	-	213	217	698	115	209	906
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	217	-	115	209	-
Stage 1	-	-	-	-	-	-	674	638	-	502	401	-
Stage 2	-	-	-	-	-	-	399	401	-	378	620	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.5	20.5	15.7
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	514	1447	-	-	1191	-	-	209	906
HCM Lane V/C Ratio	0.558	0.001	-	-	0.186	-	-	0.005	0.001
HCM Control Delay (s)	20.5	7.5	0	-	8.7	0	-	22.3	9
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	3.4	0	-	-	0.7	-	-	0	0

Intersection	
Int Delay, s/veh	10.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	326	92	337	230	0	39	0	252	1	0	0
Future Vol, veh/h	1	326	92	337	230	0	39	0	252	1	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	326	92	337	230	0	39	0	252	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	230	0	0	419	0	0	1280	1279	374	1405	1325	231
Stage 1	-	-	-	-	-	-	375	375	-	904	904	-
Stage 2	-	-	-	-	-	-	905	904	-	501	421	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1338	-	-	1140	-	-	143	166	672	117	156	808
Stage 1	-	-	-	-	-	-	646	617	-	331	356	-
Stage 2	-	-	-	-	-	-	331	356	-	552	589	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1337	-	-	1139	-	-	105	110	671	54	103	807
Mov Cap-2 Maneuver	-	-	-	-	-	-	105	110	-	54	103	-
Stage 1	-	-	-	-	-	-	645	616	-	331	235	-
Stage 2	-	-	-	-	-	-	219	235	-	344	588	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.6	36.9	72.9
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	390	1337	-	-	1139	-	-	54	-
HCM Lane V/C Ratio	0.746	0.001	-	-	0.296	-	-	0.019	-
HCM Control Delay (s)	36.9	7.7	0	-	9.5	0	-	72.9	0
HCM Lane LOS	E	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	6	0	-	-	1.2	-	-	0.1	-

Intersection												
Int Delay, s/veh	2.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	0	3	16	0	20	1	57	6	7	86	2
Future Vol, veh/h	3	0	3	16	0	20	1	57	6	7	86	2
Conflicting Peds, #/hr	7	0	11	4	0	0	11	0	4	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	0	3	16	0	20	1	57	6	7	86	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	191	181	109	180	179	71	99	0	0	67	0	0
Stage 1	112	112	-	66	66	-	-	-	-	-	-	-
Stage 2	79	69	-	114	113	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	769	713	945	782	715	991	1494	-	-	1535	-	-
Stage 1	893	803	-	945	840	-	-	-	-	-	-	-
Stage 2	930	837	-	891	802	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	737	699	925	765	701	981	1478	-	-	1525	-	-
Mov Cap-2 Maneuver	737	699	-	765	701	-	-	-	-	-	-	-
Stage 1	883	791	-	940	836	-	-	-	-	-	-	-
Stage 2	904	833	-	874	790	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.4	9.3	0.1	0.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1478	-	-	820	872	1525	-	-
HCM Lane V/C Ratio	0.001	-	-	0.007	0.041	0.005	-	-
HCM Control Delay (s)	7.4	0	-	9.4	9.3	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection												
Int Delay, s/veh	2.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	11	0	13	0	48	18	22	54	12
Future Vol, veh/h	0	0	1	11	0	13	0	48	18	22	54	12
Conflicting Peds, #/hr	8	0	9	3	0	2	9	0	3	2	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	1	11	0	13	0	48	18	22	54	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	185	182	78	174	179	68	75	0	0	69	0	0
Stage 1	113	113	-	60	60	-	-	-	-	-	-	-
Stage 2	72	69	-	114	119	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	776	712	983	789	715	995	1524	-	-	1532	-	-
Stage 1	892	802	-	951	845	-	-	-	-	-	-	-
Stage 2	938	837	-	891	797	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	745	693	966	770	696	985	1511	-	-	1520	-	-
Mov Cap-2 Maneuver	745	693	-	770	696	-	-	-	-	-	-	-
Stage 1	884	783	-	948	843	-	-	-	-	-	-	-
Stage 2	919	835	-	869	778	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.7	9.2	0	1.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1511	-	-	966	873	1520	-	-
HCM Lane V/C Ratio	-	-	-	0.001	0.027	0.014	-	-
HCM Control Delay (s)	0	-	-	8.7	9.2	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	161	71	20	59	52
Future Vol, veh/h	22	161	71	20	59	52
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	161	71	20	59	52

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	92	0	-	0	288	83
Stage 1	-	-	-	-	82	-
Stage 2	-	-	-	-	206	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1503	-	-	-	702	976
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	829	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1502	-	-	-	689	974
Mov Cap-2 Maneuver	-	-	-	-	689	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1502	-	-	-	798
HCM Lane V/C Ratio	0.015	-	-	-	0.139
HCM Control Delay (s)	7.4	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	59	65	43	5	5	44
Future Vol, veh/h	59	65	43	5	5	44
Conflicting Peds, #/hr	6	0	0	1	1	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	65	43	5	5	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	54	0	-	0	236	58
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1551	-	-	-	752	1008
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1542	-	-	-	714	997
Mov Cap-2 Maneuver	-	-	-	-	714	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	809	-

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1542	-	-	-	958
HCM Lane V/C Ratio	0.038	-	-	-	0.051
HCM Control Delay (s)	7.4	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/24/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	129	45	175	189	29	80	768	168	14	338	181
Future Volume (veh/h)	125	129	45	175	189	29	80	768	168	14	338	181
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	125	129	5	175	189	18	80	768	141	14	338	109
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	432	527	524	504	506	48	464	1437	264	284	842	815
Arrive On Green	0.07	0.28	0.28	0.09	0.30	0.30	0.05	0.48	0.48	0.02	0.45	0.45
Sat Flow, veh/h	1774	1863	1575	1774	1672	159	1774	2976	546	1774	1863	1569
Grp Volume(v), veh/h	125	129	5	175	0	207	80	457	452	14	338	109
Grp Sat Flow(s),veh/h/ln	1774	1863	1575	1774	0	1831	1774	1770	1753	1774	1863	1569
Q Serve(g_s), s	5.4	5.9	0.2	7.5	0.0	9.8	2.5	19.8	19.8	0.5	13.4	4.0
Cycle Q Clear(g_c), s	5.4	5.9	0.2	7.5	0.0	9.8	2.5	19.8	19.8	0.5	13.4	4.0
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	432	527	524	504	0	554	464	855	847	284	842	815
V/C Ratio(X)	0.29	0.24	0.01	0.35	0.00	0.37	0.17	0.53	0.53	0.05	0.40	0.13
Avail Cap(c_a), veh/h	508	527	524	545	0	554	569	855	847	444	842	815
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	30.4	24.6	23.8	0.0	30.2	14.4	19.8	19.8	16.8	20.2	13.7
Incr Delay (d2), s/veh	0.1	1.1	0.0	0.2	0.0	1.9	0.1	2.4	2.4	0.0	1.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	3.2	0.1	3.6	0.0	5.2	1.2	10.2	10.1	0.2	7.2	1.8
LnGrp Delay(d),s/veh	25.5	31.5	24.6	23.9	0.0	32.1	14.5	22.2	22.2	16.8	21.6	14.0
LnGrp LOS	C	C	C	C		C	B	C	C	B	C	B
Approach Vol, veh/h		259			382			989			461	
Approach Delay, s/veh		28.5			28.3			21.6			19.7	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.5	35.0	8.5	54.0	10.3	37.2	5.1	57.4
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	12.0	31.1	12.0	* 41	12.0	31.1	12.0	40.7
Max Q Clear Time (g_c+I1), s	9.5	7.9	4.5	15.4	7.4	11.8	2.5	21.8
Green Ext Time (p_c), s	0.1	2.0	0.0	6.1	0.1	1.8	0.0	5.6

Intersection Summary	
HCM 2010 Ctrl Delay	23.3
HCM 2010 LOS	C

Notes

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/24/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	209	117	152	206	28	115	673	198	16	412	265
Future Volume (veh/h)	200	209	117	152	206	28	115	673	198	16	412	265
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	200	209	64	152	206	24	115	673	179	16	412	138
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	492	631	624	487	524	61	326	1162	309	262	719	745
Arrive On Green	0.09	0.34	0.34	0.08	0.32	0.32	0.06	0.42	0.42	0.02	0.39	0.39
Sat Flow, veh/h	1774	1863	1574	1774	1633	190	1774	2753	732	1774	1863	1546
Grp Volume(v), veh/h	200	209	64	152	0	230	115	432	420	16	412	138
Grp Sat Flow(s),veh/h/ln	1774	1863	1574	1774	0	1823	1774	1770	1715	1774	1863	1546
Q Serve(g_s), s	7.3	8.4	2.6	5.7	0.0	9.8	3.7	18.7	18.7	0.5	17.4	5.1
Cycle Q Clear(g_c), s	7.3	8.4	2.6	5.7	0.0	9.8	3.7	18.7	18.7	0.5	17.4	5.1
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	492	631	624	487	0	585	326	747	724	262	719	745
V/C Ratio(X)	0.41	0.33	0.10	0.31	0.00	0.39	0.35	0.58	0.58	0.06	0.57	0.19
Avail Cap(c_a), veh/h	521	631	624	547	0	585	465	747	724	436	719	745
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.5	24.6	19.0	20.1	0.0	26.4	18.5	22.1	22.1	18.9	25.2	14.9
Incr Delay (d2), s/veh	0.2	1.4	0.3	0.1	0.0	2.0	0.2	3.3	3.4	0.0	3.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0
%ile BackOfQ(50%),veh/ln	3.6	4.5	1.2	2.8	0.0	5.2	1.8	9.8	9.5	0.3	12.2	2.3
LnGrp Delay(d),s/veh	19.7	26.0	19.3	20.3	0.0	28.4	18.8	25.4	25.5	18.9	33.2	15.4
LnGrp LOS	B	C	B	C		C	B	C	C	B	C	B
Approach Vol, veh/h		473			382			967			566	
Approach Delay, s/veh		22.5			25.1			24.6			28.5	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.6	37.8	8.8	42.9	12.4	36.0	5.2	46.5
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	11.0	32.1	12.0	* 31	11.0	32.1	12.0	30.7
Max Q Clear Time (g_c+I1), s	7.7	10.4	5.7	19.4	9.3	11.8	2.5	20.7
Green Ext Time (p_c), s	0.1	2.8	0.1	4.7	0.1	2.7	0.0	4.3

Intersection Summary	
HCM 2010 Ctrl Delay	25.2
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	332	28	36	193	51	56
Future Vol, veh/h	332	28	36	193	51	56
Conflicting Peds, #/hr	0	0	0	0	4	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	332	28	36	193	51	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	360	0	615	350
Stage 1	-	-	-	-	346	-
Stage 2	-	-	-	-	269	-
Critical Hdwy	-	-	4.12	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1199	-	403	693
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	737	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1194	-	391	690
Mov Cap-2 Maneuver	-	-	-	-	391	-
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	709	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	506	-	-	1194	-
HCM Lane V/C Ratio	0.211	-	-	0.03	-
HCM Control Delay (s)	14	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	417	53	55	328	47	52
Future Vol, veh/h	417	53	55	328	47	52
Conflicting Peds, #/hr	0	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	417	53	55	328	47	52

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	470	0	883	445
Stage 1	-	-	-	-	444	-
Stage 2	-	-	-	-	439	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1092	-	316	613
Stage 1	-	-	-	-	646	-
Stage 2	-	-	-	-	650	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1091	-	296	612
Mov Cap-2 Maneuver	-	-	-	-	296	-
Stage 1	-	-	-	-	646	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	406	-	-	1091	-
HCM Lane V/C Ratio	0.244	-	-	0.05	-
HCM Control Delay (s)	16.7	-	-	8.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.2	-

Intersection	
Int Delay, s/veh	34

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			↰	↱
Traffic Vol, veh/h	1	323	64	228	133	0	88	2	390	0	4	8
Future Vol, veh/h	1	323	64	228	133	0	88	2	390	0	4	8
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	323	64	228	133	0	88	2	390	0	4	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	137	0	0	391	0	0	956	954	363	1150	986	141
Stage 1	-	-	-	-	-	-	361	361	-	593	593	-
Stage 2	-	-	-	-	-	-	595	593	-	557	393	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1447	-	-	1168	-	-	238	259	682	175	248	907
Stage 1	-	-	-	-	-	-	657	626	-	492	493	-
Stage 2	-	-	-	-	-	-	491	493	-	515	606	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1441	-	-	1164	-	-	193	202	677	61	194	900
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	202	-	61	194	-
Stage 1	-	-	-	-	-	-	654	623	-	490	387	-
Stage 2	-	-	-	-	-	-	378	387	-	217	603	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.6	83.3	14
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	461	1441	-	-	1164	-	-	194	900
HCM Lane V/C Ratio	1.041	0.001	-	-	0.196	-	-	0.021	0.009
HCM Control Delay (s)	83.3	7.5	0	-	8.8	0	-	23.9	9
HCM Lane LOS	F	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	14.7	0	-	-	0.7	-	-	0.1	0

Intersection	
Int Delay, s/veh	70.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			↰			↰	↱
Traffic Vol, veh/h	15	342	112	379	317	0	66	0	315	15	0	0
Future Vol, veh/h	15	342	112	379	317	0	66	0	315	15	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	342	112	379	317	0	66	0	315	15	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	317	0	0	455	0	0	1505	1504	400	1662	1560	318
Stage 1	-	-	-	-	-	-	429	429	-	1075	1075	-
Stage 2	-	-	-	-	-	-	1076	1075	-	587	485	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1243	-	-	1106	-	-	100	121	650	77	112	723
Stage 1	-	-	-	-	-	-	604	584	-	266	296	-
Stage 2	-	-	-	-	-	-	266	296	-	496	552	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1242	-	-	1105	-	-	67	69	649	26	64	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	69	-	26	64	-
Stage 1	-	-	-	-	-	-	594	574	-	262	173	-
Stage 2	-	-	-	-	-	-	155	173	-	251	543	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	5.4	267.8	260.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	259	1242	-	-	1105	-	-	26	-
HCM Lane V/C Ratio	1.471	0.012	-	-	0.343	-	-	0.577	-
HCM Control Delay (s)	267.8	7.9	0	-	9.9	0	-	260.4	0
HCM Lane LOS	F	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	21.8	0	-	-	1.5	-	-	1.8	-

Intersection	
Int Delay, s/veh	10

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	323	64	228	133	0	88	2	390	0	4	8
Future Vol, veh/h	1	323	64	228	133	0	88	2	390	0	4	8
Conflicting Peds, #/hr	0	0	4	4	0	4	4	0	4	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	0	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	323	64	228	133	0	88	2	390	0	4	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	137	0	0	391	0	0	956	954	363	955	986	141
Stage 1	-	-	-	-	-	-	361	361	-	593	593	-
Stage 2	-	-	-	-	-	-	595	593	-	362	393	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1447	-	-	1168	-	-	238	259	682	238	248	907
Stage 1	-	-	-	-	-	-	657	626	-	492	493	-
Stage 2	-	-	-	-	-	-	491	493	-	657	606	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1441	-	-	1164	-	-	193	202	677	83	194	900
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	202	-	83	194	-
Stage 1	-	-	-	-	-	-	654	623	-	490	387	-
Stage 2	-	-	-	-	-	-	378	387	-	276	603	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.6	21.4	14
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	193	677	1441	-	-	1164	-	-	194	900
HCM Lane V/C Ratio	0.466	0.576	0.001	-	-	0.196	-	-	0.021	0.009
HCM Control Delay (s)	39	17.3	7.5	0	-	8.8	0	-	23.9	9
HCM Lane LOS	E	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	2.2	3.7	0	-	-	0.7	-	-	0.1	0

Intersection	
Int Delay, s/veh	16.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	342	112	379	317	0	66	0	315	15	0	0
Future Vol, veh/h	15	342	112	379	317	0	66	0	315	15	0	0
Conflicting Peds, #/hr	0	0	1	1	0	0	1	0	1	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	0	-	-	55
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	342	112	379	317	0	66	0	315	15	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	317	0	0	455	0	0	1505	1504	400	1504	1560	318
Stage 1	-	-	-	-	-	-	429	429	-	1075	1075	-
Stage 2	-	-	-	-	-	-	1076	1075	-	429	485	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1243	-	-	1106	-	-	100	121	650	100	112	723
Stage 1	-	-	-	-	-	-	604	584	-	266	296	-
Stage 2	-	-	-	-	-	-	266	296	-	604	552	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1242	-	-	1105	-	-	67	69	649	34	64	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	69	-	34	64	-
Stage 1	-	-	-	-	-	-	594	574	-	262	173	-
Stage 2	-	-	-	-	-	-	155	173	-	306	543	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	5.4	49.3	177.1
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	67	649	1242	-	-	1105	-	-	34	-
HCM Lane V/C Ratio	0.985	0.485	0.012	-	-	0.343	-	-	0.441	-
HCM Control Delay (s)	209.7	15.7	7.9	0	-	9.9	0	-	177.1	0
HCM Lane LOS	F	C	A	A	-	A	A	-	F	A
HCM 95th %tile Q(veh)	4.9	2.7	0	-	-	1.5	-	-	1.5	-

Intersection												
Int Delay, s/veh	1.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	0	5	11	0	15	2	100	20	21	151	4
Future Vol, veh/h	5	0	5	11	0	15	2	100	20	21	151	4
Conflicting Peds, #/hr	7	0	11	4	0	0	11	0	4	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	0	5	11	0	15	2	100	20	21	151	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	335	334	175	327	326	121	166	0	0	124	0	0
Stage 1	206	206	-	118	118	-	-	-	-	-	-	-
Stage 2	129	128	-	209	208	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	619	586	868	626	592	930	1412	-	-	1463	-	-
Stage 1	796	731	-	887	798	-	-	-	-	-	-	-
Stage 2	875	790	-	793	730	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	590	567	850	605	573	920	1397	-	-	1453	-	-
Mov Cap-2 Maneuver	590	567	-	605	573	-	-	-	-	-	-	-
Stage 1	786	712	-	882	793	-	-	-	-	-	-	-
Stage 2	853	785	-	768	711	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.2	9.9	0.1	0.9
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1397	-	-	697	754	1453	-	-
HCM Lane V/C Ratio	0.001	-	-	0.014	0.034	0.014	-	-
HCM Control Delay (s)	7.6	0	-	10.2	9.9	7.5	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection												
Int Delay, s/veh	1.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	2	11	0	13	0	84	18	23	95	21
Future Vol, veh/h	0	0	2	11	0	13	0	84	18	23	95	21
Conflicting Peds, #/hr	8	0	9	3	0	2	9	0	3	2	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	2	11	0	13	0	84	18	23	95	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	269	266	124	258	267	104	125	0	0	105	0	0
Stage 1	161	161	-	96	96	-	-	-	-	-	-	-
Stage 2	108	105	-	162	171	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	684	640	927	695	639	951	1462	-	-	1486	-	-
Stage 1	841	765	-	911	815	-	-	-	-	-	-	-
Stage 2	897	808	-	840	757	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	655	622	911	677	621	941	1449	-	-	1475	-	-
Mov Cap-2 Maneuver	655	622	-	677	621	-	-	-	-	-	-	-
Stage 1	834	746	-	908	813	-	-	-	-	-	-	-
Stage 2	878	806	-	817	738	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	9.7	0	1.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1449	-	-	911	798	1475	-	-
HCM Lane V/C Ratio	-	-	-	0.002	0.03	0.016	-	-
HCM Control Delay (s)	0	-	-	9	9.7	7.5	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	40	298	303	34	86	92
Future Vol, veh/h	40	298	303	34	86	92
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	298	303	34	86	92

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	338	0	-	0	700	322
Stage 1	-	-	-	-	321	-
Stage 2	-	-	-	-	379	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1221	-	-	-	405	719
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	692	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1220	-	-	-	388	718
Mov Cap-2 Maneuver	-	-	-	-	388	-
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	664	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	15.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1220	-	-	-	509
HCM Lane V/C Ratio	0.033	-	-	-	0.35
HCM Control Delay (s)	8.1	0	-	-	15.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.6

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	99	371	275	18	14	69
Future Vol, veh/h	99	371	275	18	14	69
Conflicting Peds, #/hr	6	0	0	1	1	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	99	371	275	18	14	69

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	299	0	-	0	860	296
Stage 1	-	-	-	-	290	-
Stage 2	-	-	-	-	570	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1262	-	-	-	326	743
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	566	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1255	-	-	-	290	735
Mov Cap-2 Maneuver	-	-	-	-	290	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	507	-

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	12.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1255	-	-	-	584
HCM Lane V/C Ratio	0.079	-	-	-	0.142
HCM Control Delay (s)	8.1	0	-	-	12.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.5

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/24/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	176	242	53	230	353	45	108	848	245	23	368	287
Future Volume (veh/h)	176	242	53	230	353	45	108	848	245	23	368	287
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	176	242	13	230	353	34	108	848	218	23	368	215
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	335	527	528	452	505	49	397	1258	323	226	798	810
Arrive On Green	0.09	0.28	0.28	0.11	0.30	0.30	0.05	0.45	0.45	0.03	0.43	0.43
Sat Flow, veh/h	1774	1863	1575	1774	1670	161	1774	2775	713	1774	1863	1569
Grp Volume(v), veh/h	176	242	13	230	0	387	108	541	525	23	368	215
Grp Sat Flow(s),veh/h/ln	1774	1863	1575	1774	0	1831	1774	1770	1719	1774	1863	1569
Q Serve(g_s), s	7.6	11.8	0.6	9.8	0.0	20.6	3.6	26.5	26.5	0.8	15.5	8.5
Cycle Q Clear(g_c), s	7.6	11.8	0.6	9.8	0.0	20.6	3.6	26.5	26.5	0.8	15.5	8.5
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	335	527	528	452	0	554	397	802	779	226	798	810
V/C Ratio(X)	0.52	0.46	0.02	0.51	0.00	0.70	0.27	0.67	0.67	0.10	0.46	0.27
Avail Cap(c_a), veh/h	373	527	528	455	0	554	497	802	779	371	798	810
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.1	32.5	24.5	23.6	0.0	33.9	16.4	23.7	23.7	19.2	22.4	14.9
Incr Delay (d2), s/veh	0.5	2.9	0.1	0.4	0.0	7.2	0.1	4.5	4.6	0.1	1.9	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	6.5	0.3	4.8	0.0	11.5	1.8	13.9	13.6	0.4	8.4	3.8
LnGrp Delay(d),s/veh	26.5	35.4	24.6	24.0	0.0	41.1	16.5	28.2	28.3	19.3	24.3	15.7
LnGrp LOS	C	D	C	C		D	B	C	C	B	C	B
Approach Vol, veh/h		431			617			1174			606	
Approach Delay, s/veh		31.5			34.7			27.2			21.1	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.8	35.0	8.8	51.4	12.6	37.2	6.0	54.2
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	12.0	31.1	12.0	* 41	12.0	31.1	12.0	40.7
Max Q Clear Time (g_c+I1), s	11.8	13.8	5.6	17.5	9.6	22.6	2.8	28.5
Green Ext Time (p_c), s	0.0	3.7	0.1	7.5	0.1	2.5	0.0	5.6

Intersection Summary	
HCM 2010 Ctrl Delay	28.2
HCM 2010 LOS	C

Notes

HCM 2010 Signalized Intersection Summary
5: Petaluma Hill Rd & Kawana Springs Rd

03/24/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	447	132	178	345	39	137	678	317	30	415	365
Future Volume (veh/h)	226	447	132	178	345	39	137	678	317	30	415	365
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	226	447	79	178	345	35	137	678	298	30	415	238
Adj No. of Lanes	1	1	1	1	1	0	1	2	0	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	397	630	635	337	533	54	307	951	418	224	687	733
Arrive On Green	0.10	0.34	0.34	0.09	0.32	0.32	0.06	0.40	0.40	0.03	0.37	0.37
Sat Flow, veh/h	1774	1863	1574	1774	1659	168	1774	2377	1045	1774	1863	1545
Grp Volume(v), veh/h	226	447	79	178	0	380	137	505	471	30	415	238
Grp Sat Flow(s),veh/h/ln	1774	1863	1574	1774	0	1828	1774	1770	1652	1774	1863	1545
Q Serve(g_s), s	8.3	20.9	3.2	6.6	0.0	17.8	4.6	23.9	23.9	1.0	18.1	9.6
Cycle Q Clear(g_c), s	8.3	20.9	3.2	6.6	0.0	17.8	4.6	23.9	23.9	1.0	18.1	9.6
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.63	1.00		1.00
Lane Grp Cap(c), veh/h	397	630	635	337	0	587	307	708	661	224	687	733
V/C Ratio(X)	0.57	0.71	0.12	0.53	0.00	0.65	0.45	0.71	0.71	0.13	0.60	0.32
Avail Cap(c_a), veh/h	409	630	635	380	0	587	431	708	661	377	687	733
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.8	28.8	18.8	21.9	0.0	29.1	19.5	25.2	25.2	20.4	26.7	16.5
Incr Delay (d2), s/veh	1.1	6.7	0.4	0.5	0.0	5.5	0.4	6.0	6.5	0.1	3.9	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0
%ile BackOfQ(50%),veh/ln	4.1	11.8	1.4	3.2	0.0	9.9	2.3	12.8	12.0	0.5	12.8	4.3
LnGrp Delay(d),s/veh	21.8	35.5	19.2	22.3	0.0	34.6	19.9	31.2	31.6	20.5	36.1	17.7
LnGrp LOS	C	D	B	C		C	B	C	C	C	D	B
Approach Vol, veh/h		752			558			1113			683	
Approach Delay, s/veh		29.7			30.7			30.0			29.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.6	37.7	9.5	41.2	13.3	36.0	6.4	44.3
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3
Max Green Setting (Gmax), s	11.0	32.1	12.0	* 31	11.0	32.1	12.0	30.7
Max Q Clear Time (g_c+I1), s	8.6	22.9	6.6	20.1	10.3	19.8	3.0	25.9
Green Ext Time (p_c), s	0.1	3.7	0.1	5.2	0.0	4.4	0.0	2.9

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Notes

Appendix C

Proportional Share Calculations

Equitable Share Calculations
Aston Avenue/Linwood Avenue

		Total Volume Entering the Intersection of	
		Penstemon Place	
	PM		PM
		Existing	1243
Project Trips (T)	35	Future Year	1526

Description of Project Improvement:

Widen Linwood Avenue to add a 100 foot left turn lane. It was assumed that widening would occur on the west side of the roadway as the City currently has the right of way.

Calculation of Project Share

P = T / (TB - TE)
where:
P = Equitable Share
T = Project trips during the affected peak hour
TB = Build-out volumes
TE = Existing volumes

T	35
TB	1526
TE	1243
P	**12.4%**

Total Estimated Cost of Improveme $225,000

Equitable Share Contribution **$27,827**

Equitable Share (per Caltrans "Guide for the Preparation of Traffic Impact Studies")

Appendix D

All-Way Stop-Control Warrant

All Way Stop Control (AWSC) Warrant Criteria
from California MUTCD (adopted 2012)

MAJOR Street Name: Linwood Ave
MINOR Street Name: Poinsettia Ln
City of Santa Rosa

Prepared By: BKB
Date: 1.9.2018

Intersection may be a candidate for an AWSC (aka a Multi-Way Stop sign installation) if any one of these criteria are met.

		Traffic Signal Warranted
No	A	Where a traffic signal is warranted, the AWSC is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the signal.
No	B	**Collisions** There been at least 5 collisions, of a type that could be correctable through STOP installation, within the last 12 months. Such correctable collisions include right-turn, left-turn, and right-angle collisions.
		Minimum Volumes
	C1	The vehicular volume entering the intersection from the MAJOR street approaches (total of both) averages at least 300 vehicles per hour for any 8 hours of any average day,
		AND
No	C2	The combined vehicular, ped, and bicycle volumes entering the intersection from the MINOR street approaches (total of both) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 sec/vehicle during the highest one hour.
		OR
No	C3	If the 85th-percentile approach speed of the MAJOR street traffic >40 mph, the minimum vehicular volume warrants are 70 percent of the above values.
		Combination Warrant
No	D	Where no single criterion is satisfied (A, B, C1, C2 or C3), but where 80 percent of B and C1 and C2 are met.
		Options
		Other criteria that may be considered in an engineering study include:
No	A.	The need to control left-turn conflicts
No	B.	The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes
Yes	C.	(Visibility) Locations where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the inteersection unless conflicting cross traffic is also required to stop,
No	D.	An intersection of 2 residential neighborhood collector (through) streets of similar design and operating characteristics where AWSC would improve traffic operational characteristics of the intersection.

The All-Way Stop Control Warrant has been met

ATTACHMENT C

CAP NEW DEVELOPMENT CHECKLIST

Penstemon Place

CAP NEW DEVELOPMENT CHECKLIST

ATTACHMENT C

PENSTEMON PLACE

To ensure new development projects are compliant with the City's Climate Action Plan, the following checklist has been developed. This checklist should be filled out for each new project, subject to discretionary review, to allow new development to find a less than significant impact for greenhouse gas emissions in the environmental review process.

#	Description	Compliance			
		Complies	Does Not Comply	N/A	See Discussion
1.1.1	Comply with Cal Green Tier 1 standards*	X			exceeds
1.1.3	If after 2020, all new development will utilize zero net electricity*			X	
1.3.1	Install real-time energy monitors to track energy use*	X			
1.4.2	Comply with the City's tree preservation ordinance*	X			
1.4.3	Provide public and private trees in compliance with the zoning code*	X			
1.5	Install new sidewalks and paving with high solar reflectivity materials*	X			
2.1.3	Pre-wire and pre-plumb for solar thermal or PV systems	X			
3.1.2	Supports implementation of station plans and corridor plans			X	
3.2.1	Provide on-site services such as ATMs or dry cleaning to site users			X	
3.2.2	Improve non-vehicular network to promote walking and biking	X			
3.2.3	Support mixed use, higher density development near services	X			
3.3.1	Provide affordable housing near transit			X	
3.5.1	Unbundle parking from property cost			X	
3.6.1	Install calming features to improve ped/bike experience	X			
4.1.1	Implement the Bicycle & Pedestrian Master Plan	X			
4.1.2	Install bicycle parking consistent with regulations*			X	
4.1.3	Provide bicycle safety training to residents and employees			X	
4.2.2	Provide safe spaces to wait for bus arrival			X	
4.3.2	Provide parking for car sharing operations	X			
4.3.4	Work with large employers to provide rideshare programs			X	
4.3.5	Consider expanding employee programs promoting transit use			X	
4.3.6	Provide awards for employee use of alternative commute options			X	
4.3.7	Require new employers of 50+ provide subsidized transit passes*			X	
4.3.9	Provide space for additional Park-and-Ride lots			X	
4.5.1	Include facilities for residents that promote telecommuting	X			
5.1.2	Install electric vehicle charging equipment	X			
5.2.1	Provide alternative fuels at new re-fueling stations*			X	
6.1.4	Increase diversion of construction waste*	X			
7.1.1	Reduce potable water use for outdoor landscaping*	X			
7.1.3	Use water meters which track real-time water use*	X			
7.3.2	Install dual plumbing in locations with current or future recycled water capabilities*			X	
8.1.3	Establish community gardens and urban farms	X			
9.1.2	Provide outdoor electrical outlets for charging lawn equipment	X			
9.1.3	Install low water use landscapes*	X			
9.2.1	Minimize construction equipment idling time to 5 minutes or less*	X			
9.2.2	Maintain construction equipment per manufacturer's specs*	X			
9.2.3	Limit GHG construction equipment emissions by using electrified equipment of alternative fuels*	X			exceeds

*To be in compliance with the CAP, all measures denoted with an asterisk are required in all new development projects unless otherwise specified. If a project cannot meet one or more of the mandatory requirements, substitutions may be made from other measures listed at the discretion of the Chief Building Official.

ATTACHMENT D-1

BIOLOGICAL RESOURCES ASSSESSMENT

Penstemon Place Development Project

WRA, Inc.

March, 2017
July 25, 2017
June 6, 2017

Biological Resources Assessment

PENSTEMON PLACE DEVELOPMENT PROJECT
SANTA ROSA, SONOMA COUNTY, CALIFORNIA

Prepared For:

Aaron Matz
P.O. Box 6858
Santa Rosa, CA 95406

Prepared By:

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San Rafael, California 94901

Contact: Doug Spicher, Principal
spicher@wra-ca.com

Date:

March 2017

WRA Project No:

25096

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LIST OF ACRONYMS AND ABBREVIATIONS

BMPs	Best Management Practices
BRA	Biological Resources Assessment
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CTS	California tiger salamander
ESA	Federal Endangered Species Act
Inventory	CNPS Inventory of Rare and Endangered Plants
MSL	Mean Sea Level
MBTA	Migratory Bird Treaty Act
OWHM	Ordinary High Water Mark
PBO	Programmatic Biological Opinion
Rank	California Rare Plant Rank
RWQCB	Regional Water Quality Control Board
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBWG	Western Bat Working Group
WRA	WRA, Inc.

1.0 INTRODUCTION

WRA, Inc. (WRA) prepared this biological resources assessment (BRA) report on behalf of McIntosh Development, LLC for the proposed Penstemon Place Development Project (Project). The proposed Project involves the development of an approximately 9.7-acre property located at 2842, 2862, and 2574 Linwood Avenue (APNs #044-200-027, -029, -040), in the southeast quadrant of the City of Santa Rosa, Sonoma County, California (Project Area; Figure 1). The purpose of the assessment was to gather information necessary to complete a review of biological resources under the California Environmental Quality Act (CEQA). WRA conducted a previous jurisdictional wetland delineation at the site in 2015. The results of the jurisdictional wetland delineation are also provided in this report.

This report describes the results of the site visits, which assessed the Project Area for the (1) potential to support special-status species, (2) the potential presence of sensitive biological communities such as wetlands or riparian habitats, and (3) the potential presence of other sensitive biological resources protected by local, state, and federal laws and regulations. Specific findings on the habitat suitability or the presence of special-status species or sensitive habitats may require that protocol-level surveys be conducted.

A BRA provides general information on the potential presence of sensitive species and habitats. The BRA is not an official protocol-level survey for listed species that may be required for project approval by local, state, or federal agencies. This assessment is based on information available at the time of the study and on site conditions that were observed on the date of the site visit(s).

2.0 REGULATORY BACKGROUND

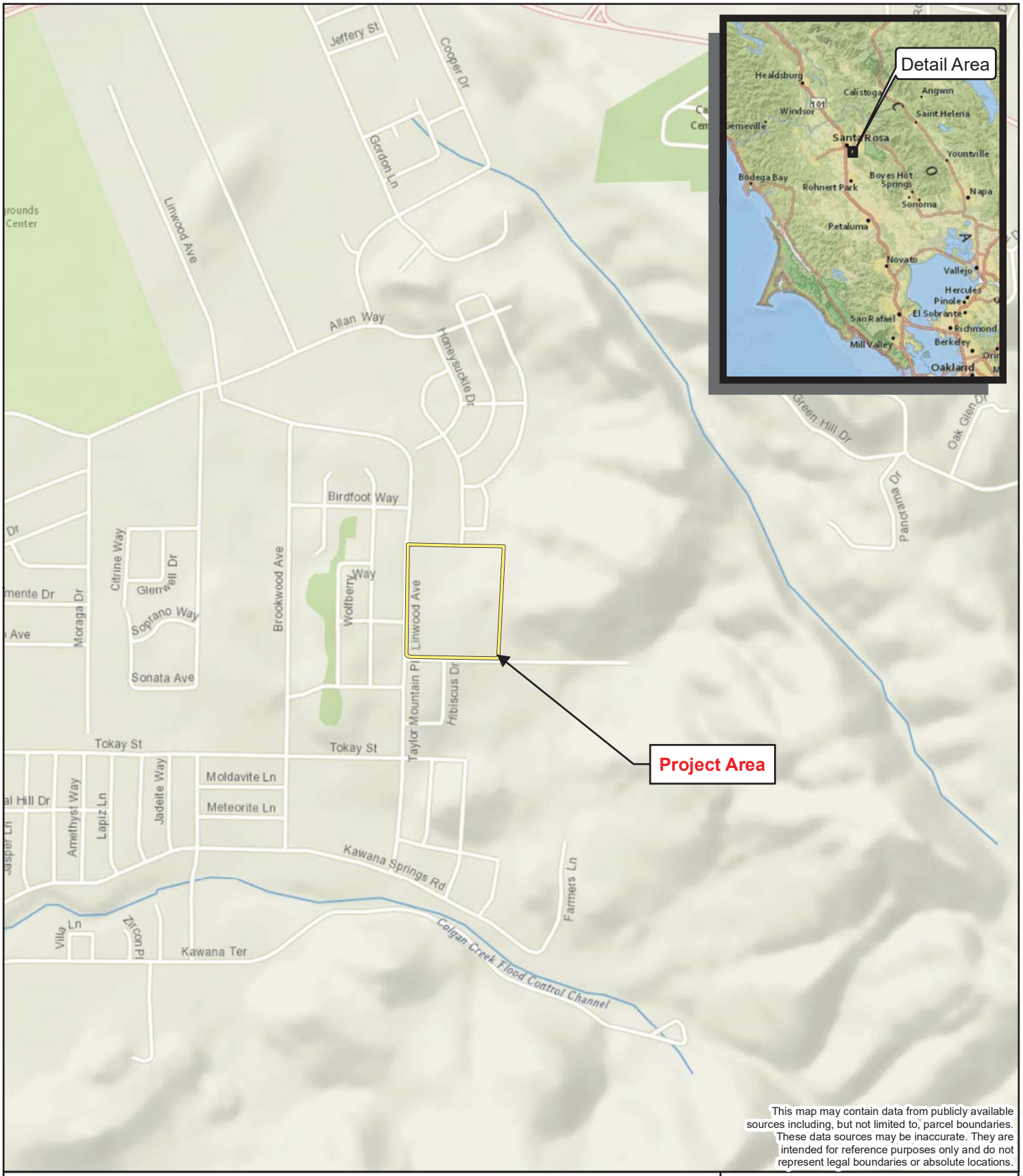
The following sections explain the regulatory context of the BRA, including applicable laws and regulations that were applied to the field investigations and analysis of potential project impacts.

2.1 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, or riparian habitat. These habitats are protected under federal regulations such as the Clean Water Act; state regulations such as the Porter-Cologne Act, the California Fish and Game Code (CFGC), and the CEQA; or local ordinances or policies such as city or county tree ordinances, Special Habitat Management Areas, and General Plan Elements.

<u>Waters of the United States</u>

The U.S. Army Corps of Engineers (Corps) regulates “Waters of the United States” under Section 404 of the Clean Water Act. Waters of the U.S. are defined in the Code of Federal Regulations (CFR) as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3)



This map may contain data from publicly available sources including, but not limited to, parcel boundaries. These data sources may be inaccurate. They are intended for reference purposes only and do not represent legal boundaries or absolute locations.

Figure 1. Project Area Location Map

DRAFT

Penstemon Place Development Project
Sonoma County, California

0 250 500 1,000
Feet

wra
ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 1/9/2017
Map Prepared By: fhourigan
Base Source: Esri Streaming - National Geographic
Data Source(s): WRA

Path: L:\Acad 2000 Files\25000\25096\GIS\ArcMap\LocationMap.mxd

wetland hydrology. Areas that are inundated at a sufficient depth and for a sufficient duration to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as "other waters" or "non-wetland waters" and are often characterized by an ordinary high water mark (OHWM). Other waters or non-wetland waters, for example, generally include lakes, rivers, and streams. The placement of fill material into Waters of the U.S generally requires an individual or nationwide permit from the Corps under Section 404 of the Clean Water Act.

Waters of the State

The term "Waters of the State" is defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope and has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes "isolated" wetlands and waters that may not be regulated by the Corps under Section 404. Waters of the State are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the Clean Water Act and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact Waters of the State, are required to comply with the terms of the Water Quality Certification determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to Waters of the State, the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

Other Sensitive Biological Communities

Other sensitive biological communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife (CDFW, formerly the California Department of Fish and Game [CDFG]). The CDFW ranks sensitive communities and keeps records of their occurrences in its California Natural Diversity Database (CNDDB; CDFW 2017). In the CNDDB, vegetation alliances are ranked 1 through 5 based on NatureServe's (2016) methodology, with those alliances ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified in local or regional plans, policies, or regulations or those identified by the CDFW or U.S. Fish and Wildlife Service (USFWS) must be considered and evaluated under CEQA (California Code of Regulations [CCR] Title 14, Div. 6, Chap. 3, Appendix G). Specific habitats may also be identified as sensitive in city or county general plans or ordinances.

2.2 Special-Status Species

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the Federal Endangered Species Act (ESA) or California Endangered Species Act (CESA). These acts afford protection to both listed species and those that are formal candidates for listing. In addition, CDFW Species of Special Concern, which are species that face extirpation in California if current population and habitat trends continue, CDFW California Fully Protected species, USFWS Birds of Conservation Concern, and CDFW special-status invertebrates, are all considered special-status species. Although these aforementioned species generally have no special legal status, they are given special consideration under CEQA. Bat species are also

evaluated for conservation status by the Western Bat Working Group (WBWG), a non-governmental entity; bats named as a "High Priority" or "Medium Priority" species for conservation by the WBWG are typically considered special-status and are considered under CEQA. Plant species on the California Native Plant Society (CNPS) Rare and Endangered Plant Inventory (Inventory) with California Rare Plant Ranks (Rank) of 1 through 4 are also considered special-status plant species and must be considered under the CEQA. A description of the CNPS Ranks is provided below in Table 1. In addition to regulations for special-status species, most birds in the United States, including non-special-status native species, are protected by the Migratory Bird Treaty Act of 1918 (MBTA) and the CFGC. Under these laws, destroying active bird nests, eggs, and/or young is illegal.

Table 1. Description of CNPS Ranks and Threat Codes

California Rare Plant Ranks (formerly known as CNPS Lists)	
Rank 1A	Presumed extirpated in California and either rare or extinct elsewhere
Rank 1B	Rare, threatened, or endangered in California and elsewhere
Rank 2A	Presumed extirpated in California, but more common elsewhere
Rank 2B	Rare, threatened, or endangered in California, but more common elsewhere
Rank 3	Plants about which more information is needed - A review list
Rank 4	Plants of limited distribution - A watch list
Threat Ranks	
0.1	Seriously threatened in California
0.2	Moderately threatened in California
0.3	Not very threatened in California

Santa Rosa Plain Conservation Strategy

The Project Area is located within the Santa Rosa Plain, an ecoregion which supports habitat for many vernal pool-associated special-status species. The USFWS developed the Santa Rosa Plain Conservation Strategy (Conservation Strategy; USFWS et al. 2005) as a conservation plan for these species. The Santa Rosa Plain Conservation Strategy Area is an area established by the USFWS for the protection and continued existence of California tiger salamander (CTS, *Ambystoma californiense*) and three endangered plant species: Burke's goldfields (*Lasthenia burkei*), Sonoma sunshine (*Blennosperma bakeri*), and Sebastopol meadowfoam (*Limnanthes vinculans*). The Conservation Strategy (USFWS 2005) outlines the specific species of concern for this area along with guidance for specific conservation measures. In 2007 the Corps consulted with the USFWS on Section 404 permitting within the Conservation Strategy area which resulted in a Programmatic Biological Opinion (PBO). This 2007 PBO outlines the mitigation requirements resulting from impacts to wetlands and associated impacts to CTS and the three listed plants, and can be appended to permits authorized by the Corps. It is the PBO that dictates the mitigation requirements for CTS and the three listed plant species.

Critical Habitat

Critical habitat is a term defined in the ESA as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The ESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. In many cases, this level of protection is similar to that already provided to species by the ESA jeopardy standard. However, areas that are currently unoccupied by the species but which are needed for the species' recovery are protected by the prohibition against adverse modification of critical habitat.

2.3 Local Policies, Ordinances, and Regulations

City of Santa Rosa Tree Ordinance

The City of Santa Rosa recognizes the aesthetic, environmental, and economic benefits mature trees provide to the citizens of the City. Chapter 17-24, "Trees" of the Santa Rosa City Code (Tree Ordinance) regulates the protection of certain trees on public and private properties within the City limits. The Tree Ordinance defines a "heritage tree" as: valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), or buckeye (*Aesculus californica*) 19 inches circumference at breast height (measured at 4.5 feet above ground; or 6 inches diameter at breast height [DBH]) or greater; madrone (*Arbutus menziesii*) 38 inches circumference (12 inches DBH) or greater; coast live oak (*Q. agrifolia*), black oak (*Q. kelloggii*), Oregon oak (*Q. garryana*), canyon live oak (*Q. chrysolepis*), interior live oak (*Q. wislizenii*), red alder (*Alnus rubra* [*A. oregona*]), or white alder (*A. rhombifolia*) 57 inches circumference (18 inches DBH) or greater; or redwood (*Sequoia sempervirens*), bay (*Umbellularia californica*), Douglas fir (*Pseudotsuga menziesii*), or big-leaf maple (*Acer macrophyllum*) 75 inches circumference (24 inches DBH) or greater. A Tree Permit is generally required for the removal, alteration or relocation of any "heritage tree", "protected tree" (i.e. any tree, including a heritage tree, designated to be preserved on an approved development plan or as a condition of approval of a tentative map, a tentative parcel map, or other development approval issued by the City), or "street tree" (i.e. any tree having a single trunk circumference greater than 6.25 inches or a diameter greater than 2 inches, a height of more than six feet, and one half or more of its trunk is within a public right of way or within 5 feet of the paved portion of a City street or a public sidewalk), except as exempted in Section 17-24.030 of the Tree Ordinance.

3.0 METHODS

Site visits were conducted by WRA biologists on April 20, 2015 and December 21, 2016. The Project Area was traversed on foot to determine (1) plant communities present within the Project Area, (2) whether existing conditions provide suitable habitat for any special-status plant or wildlife species, and (3) whether sensitive habitats are present. All plant and wildlife species encountered were recorded and are summarized in Appendix A. Plant nomenclature follows Baldwin et al. (2012) and subsequent revisions by the Jepson Flora Project (2017), except where noted. For cases in which regulatory agencies, CNPS, or other entities base rarity on older taxonomic treatments, precedence was given to the treatment used by those entities.

A separate wetland delineation was conducted to document the presence of wetlands and non-wetland waters potentially subject to jurisdiction by the Corps, RWQCB, and/or CDFW. The methods of the delineation are summarized here. A detailed accounting of the methods used in the delineation are provided in a separate delineation report (WRA 2015).

3.1 Biological Communities

Prior to the site visit, the *Soil Survey of Sonoma County*, California [U.S. Department of Agriculture (USDA) 1972] and SoilWeb (USDA 2016) were examined to determine if any unique soil types that could support sensitive plant communities and/or aquatic features were present in the Project Area. Biological communities present in the Project Area were classified based on existing plant community descriptions described in the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) or *California Vegetation Manual* (Sawyer et. al. 2009, CNPS 2016a). However, in some cases it is necessary to identify variants of community types or to describe non-vegetated areas that are not described in the literature. Biological communities were classified as sensitive or non-sensitive as defined by CEQA and other applicable laws and regulations.

3.1.1 Non-Sensitive Biological Communities

Non-sensitive biological communities are those communities that are not afforded special protection under CEQA, and other state, federal, and local laws, regulations and ordinances. These communities may, however, provide suitable habitat for some special-status plant or wildlife species and are identified or described in Section 4.1.1 below.

3.1.2 Sensitive Biological Communities

Sensitive biological communities are defined as those communities that are given special protection under CEQA and other applicable federal, state, and local laws, regulations and ordinances. Special methods used to identify sensitive biological communities are discussed below.

<u>Wetlands and Non-Wetland Waters</u>

Wetlands and non-wetland waters potentially subject to jurisdiction by the Corps, RWQCB, and/or CDFW were mapped following standard methods from the Corps (Environmental Laboratory 1987, Corps 2008a, b). Identification of wetlands focused on the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) indicators of wetland hydrology. Identification of non-wetland waters focused on the presence of an OHWM.

<u>Other Sensitive Biological Communities</u>

The Project Area was evaluated for the presence of other sensitive biological communities, including riparian areas or other sensitive plant communities recognized by CDFW. Prior to the site visit, aerial photographs, local soil maps, and *A Manual of California Vegetation, Online Edition* (CNPS 2016a) were reviewed to assess the potential for sensitive biological communities to occur in the Project Area. All alliances within the Project Area with a ranking of 1 through 3 were considered sensitive biological communities and mapped. These communities are described in Section 4.1.2 below.

3.2 Special-Status Species

3.2.1 Literature Review

Potential occurrence of special-status species in the Project Area was evaluated by first determining which special-status species occur in the vicinity of the Project Area through a literature and database search. Database searches for known occurrences of special-status species focused on the Santa Rosa 7.5-minute U.S. Geological Survey (USGS) quadrangle and the eight surrounding quadrangles: Healdsburg, Sebastopol, Two Rock, Cotati, Glen Ellen, Kenwood, Calistoga, and Mark West Springs. The following sources were reviewed to determine which special-status plant and wildlife species have been documented to occur in the vicinity of the Project Area:

- CNDDB records (CDFW 2017)
- USFWS Information for Planning and Conservation Report (IPaC; USFWS 2016)
- CNPS Rare and Endangered Plant Inventory (CNPS 2016b)
- CDFG publication "California's Wildlife, Volumes I-III" (Zeiner et al. 1990)
- CDFG publication "California Bird Species of Special Concern" (Shuford and Gardali 2008)
- CDFW and University of California Press publication California Amphibian and Reptile Species of Special Concern (Thomson *et al.* 2016)
- *A Flora of Sonoma County* (Best et al. 1996)
- *Marin Flora* (Howell et al. 2007)
- *A Field Guide to Western Reptiles and Amphibians* (Stebbins 2003)
- *Sonoma County Breeding Bird Atlas* (Madrone Audubon Society 1995)
- Santa Rosa Plain Conservation Strategy (USFWS 2005)
- Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007)
- Final Recovery Plan for the Santa Rosa Plain (USFWS 2016)

3.2.2 Site Assessment

A site visit was made to the Project Area to search for suitable habitats for special-status species. Habitat conditions observed at the Project Site were used to evaluate the potential for presence of special-status species based on these searches and the professional expertise of the investigating biologists. The potential for each special-status species to occur in the Project Area was then evaluated according to the following criteria:

- **No Potential:** Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).
- **Unlikely:** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.
- **Moderate Potential:** Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
- **High Potential:** All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

- **Present:** Species is observed on the site or has been recorded (i.e., CNDDB, other reports) on the site recently.

The site assessment is intended to identify the presence or absence of suitable habitat for each special-status species known to occur in the vicinity in order to determine its potential to occur in the Project Area. The site visit does not constitute a protocol-level survey and is not intended to determine the actual presence or absence of a species; however, if a special-status species is observed during the site visit, its presence will be recorded and discussed.

In cases where little information is known about species occurrences and habitat requirements, the species evaluation was based on best professional judgment of WRA biologists with experience working with the species and habitats. If necessary, recognized experts in individual species biology were contacted to obtain the most up to date information regarding species biology and ecology.

If a special-status species was observed during the site visit, its presence is recorded and discussed below in Section 4.2. For some species, a site assessment at the level conducted for this report may not be sufficient to determine presence or absence of a species to the specifications of regulatory agencies. In these cases, a species may be assumed to be present or further protocol-level special-status species surveys may be necessary. Special-status species for which further protocol-level surveys may be necessary are described below in Section 5.0.

4.0 RESULTS

A general description of the Project Area and the results of the site assessment are provided in the following sections. A list of plant and wildlife species observed is included as Appendix A. The assessment of the potential for special-status plant and wildlife species to occur in the Project Area is provided as Appendix B. Photographs of the Project Area are provided as Appendix C.

Project Area Description

The Project Area consists of approximately 9.7 acres of predominantly vacant land dominated by non-native grassland and seasonal wetland. Six existing single-family residences are located on the outer perimeter of the Project Area, some of which were vacant and some were occupied at the time of the site visits. An old concrete two-track driveway originating from Linwood Avenue bisects the Project Area from west to east. The Project Area is bordered by single-family and rural residential development to the north, south, east and west. A right-of-way for the planned Farmers Lane extension forms the eastern boundary of the Project Area. Evidence of previous human disturbance within the undeveloped portion of the Project Area observed during the site visits and review of recent aerial photography (Google Earth 2017) include mowing and/or discing, small-scale cultivation (i.e. vegetable garden), and development of a water well.

Topography and Soils

The topography in the Project Area is relatively flat in the western half, transitioning to mildly sloping in the eastern half. Elevations within the Project Area range from approximately 285 feet above mean sea level (amsl) at the eastern border of the site, to approximately 233 feet

amsl in northwest corner of the site. SoilWeb (USDA 2016) indicates that the Project Area contains one native soil type, Raynor clay, 2 to 9 percent slopes. Generally, observed soils within the Study Area were native with no areas of imported soil with the possible exception of some areas immediately adjacent to the residential homes surrounding the property.

Raynor Series soils consist of well drained clays formed over volcanic and andesitic rocks and lie at elevations ranging from 200 to 1,200 feet above sea level (CSRL 2016, USDA 1977). Land uses generally consist of pastureland, and annual grasses and forbs with scattered oaks comprise the native or naturalized vegetation (USDA 1977).

A representative pedon of Raynor clay consists of an A-horizon of slightly acid, black clay (10YR 2/1), when moist, and approximately 1.5 feet deep. Structure is granular in the upper half and prismatic below. Raynor soils would have the potential to support episaturated soil that can support wetlands conditions, particularly in swale, lowland, or depression microtopography due the thickness of the clay layer.

Climate and Hydrology

Average annual precipitation for Santa Rosa is 25 inches, with the majority falling as rain in the winter months (December through March). The mean daily high temperatures in degrees Fahrenheit range from 56 in December to 81 in September. The mean daily low temperatures in degrees Fahrenheit range from 42 in December to 53 in September (WRCC 2017). Sources of hydrology within the Project Area include direct precipitation and surface runoff from adjacent slopes to the east.

4.1 Prior Studies

WRA conducted a routine wetland delineation within the Project Area on April 20, 2015 (WRA 2015). Two wetland types, seasonal wetland and perennial wetland were identified within the Project Area during the 2015 site visit. The boundaries of delineated seasonal and perennial wetlands were confirmed during the 2016 site visit based on observed hydrology indicators.

4.2 Biological Communities

Table 2 summarizes the area of each biological community type observed in the Project Area. The Project Area is dominated by non-native annual grassland with inclusions of seasonal and perennial wetlands. Descriptions for each biological community are contained in the following sections and depicted in Figure 2.

Table 2. Summary of Biological Communities in the Project Area

Community Type	Area (acres)
Non-native annual grassland	6.43
Seasonal wetland	1.41
Perennial wetland	0.05
Developed/disturbed	1.80
Total	**9.70**

Figure 2. Biological Communites

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ENVIRONMENTAL CONSULTANTS

Penstemon Place Development Project
Sonoma County, California

Map Prepared Date: 1/11/2017
Map Prepared By: fhourigan
Base Source: ESRI Streaming, BING maps
Data Source(s): WRA

Path: L:\Acad 2000 Files\25000\25096\GIS\ArcMap\BioComms.mxd

4.2.1 Non-Sensitive Biological Communities

Non-Native Annual Grassland

Holland (1986) describes non-native grassland as a dense to sparse cover of annual grasses, often associated with numerous species of showy-flowered, native and non-native annual forbs. Non-native annual grasslands within the Project Area were dominated by a mix of non-native grasses, predominantly slim oat (*Avena barbata*), soft chess (*Bromus hordeaceus*), ripgut brome (*B. diandrus*), and Italian rye grass (*Festuca perennis*), with Harding grass (*Phalaris aquatica*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), and mouse barley (*H. murinum*) present in lower densities. Common forbs in the herbaceous layer included spring vetch (*Vicia sativa*), wild radish (*Raphanus sativus*), big heron bill (*Erodium botrys*), and coastal heron's bill (*Erodium cicutarium*). Individual mature valley oak trees (*Quercus lobata*), and small clusters of other trees including Northern California black walnut (*Juglans hindsii*) are also mapped in this community. Individual native trees within this community, such as the mature valley oak trees are large enough to be considered heritage trees per the Santa Rosa Tree Ordinance. A total of 6.43 acres of non-native annual grassland were mapped within the Project Area.

Developed/Disturbed

Developed/disturbed portions of the Project Area include previously developed single-family residences around the perimeter of the Project Area. Some residences were vacant and some were occupied during the time of the site visit. Developed/disturbed areas include the buildings, driveways, backyards and associated landscaping. Dominant vegetation within the developed/disturbed areas consists of a mixture of ornamental and native, presumably planted tree and shrub species including London plane (*Platanus* x *acerifolia*), valley oak, coast live oak (*Quercus agrifolia*), oleander (*Nerium oleander*), and juniper (*Juniperus* sp.). Herbaceous species within this community are predominantly non-native grasses and forbs. This community contains several native tree species large enough to be considered heritage trees per the Santa Rosa Tree Ordinance.

4.2.2 Sensitive Biological Communities

Seasonal Wetland

One contiguous potential seasonal wetland feature, occupying approximately 1.41 acres, was delineated within the Project Area in 2015 (WRA 2015). The delineated boundary of the seasonal wetland was confirmed during the 2016 site visit based on observed hydrology indicators including standing water, high water table and drainage patterns. The seasonal wetland feature within the Project Area is likely the result of heavy clay soil through which water moves slowly and creates wetland characteristics, including a prevalence of hydrophytic plants, hydric soils, and wetland hydrology. These seasonal wetlands are on generally sloping topography with some areas that are level with subtle depressions or are blocked (e.g., by the approximately 10-inch concrete culvert under the old concrete driveway) where water inundates the surface and creates wetland hydrology surface indicators, such as algal mat formation. The seasonal wetland feature drains offsite into a drainage ditch and culvert at the northwest corner of the Project Area.

Seasonal wetlands within the Project Area were dominated by hydrophytic grasses including Italian ryegrass, and Mediterranean barley, with other hydrophytic forbs and grasses present

including iris-leaf rush (*Juncus xiphioides*), pennyroyal (*Mentha pulegium*), tall cyperus (*Cyperus eragrostis*), meadow barley (*Hordeum branchyantherum*), and spiny buttercup (*Ranunculus muricatus*). Areas mapped as seasonal wetland contain a prevalence or dominance of hydrophytic vegetation, hydric soils, and wetland hydrology sufficient to meet the requirements as jurisdictional features under Section 404 of the Clean Water Act.

Perennial Wetland

One discrete potential perennial wetland feature, occupying approximately 0.05 acre, was delineated within the Project Area in 2015 (WRA 2015). The perennial wetland feature is nested within the broader seasonal wetland, and located in the southeast quadrant of the Project Area. The perennial wetland feature appears to contain surface water or saturated soil near the surface from a high water table for most of the year as evidenced by the perennial wetland species, narrow-leaf cattail (*Typha angustifolia*), which was dominant within this feature. Other vegetation observed in the perennial wetland included iris-leaf rush, pennyroyal, and Arroyo willow (*Salix lasiolepis*). Soils were either saturated or minor surface inundation during the 2015 and 2016 site visits. This wetland was located downslope of a hillside slump located to the northeast and may be the discharge point of an underground seep. The area mapped as perennial wetland contains a prevalence or dominance of hydrophytic vegetation, hydric soils, and wetland hydrology sufficient to meet the requirements as jurisdictional features under Section 404 of the Clean Water Act.

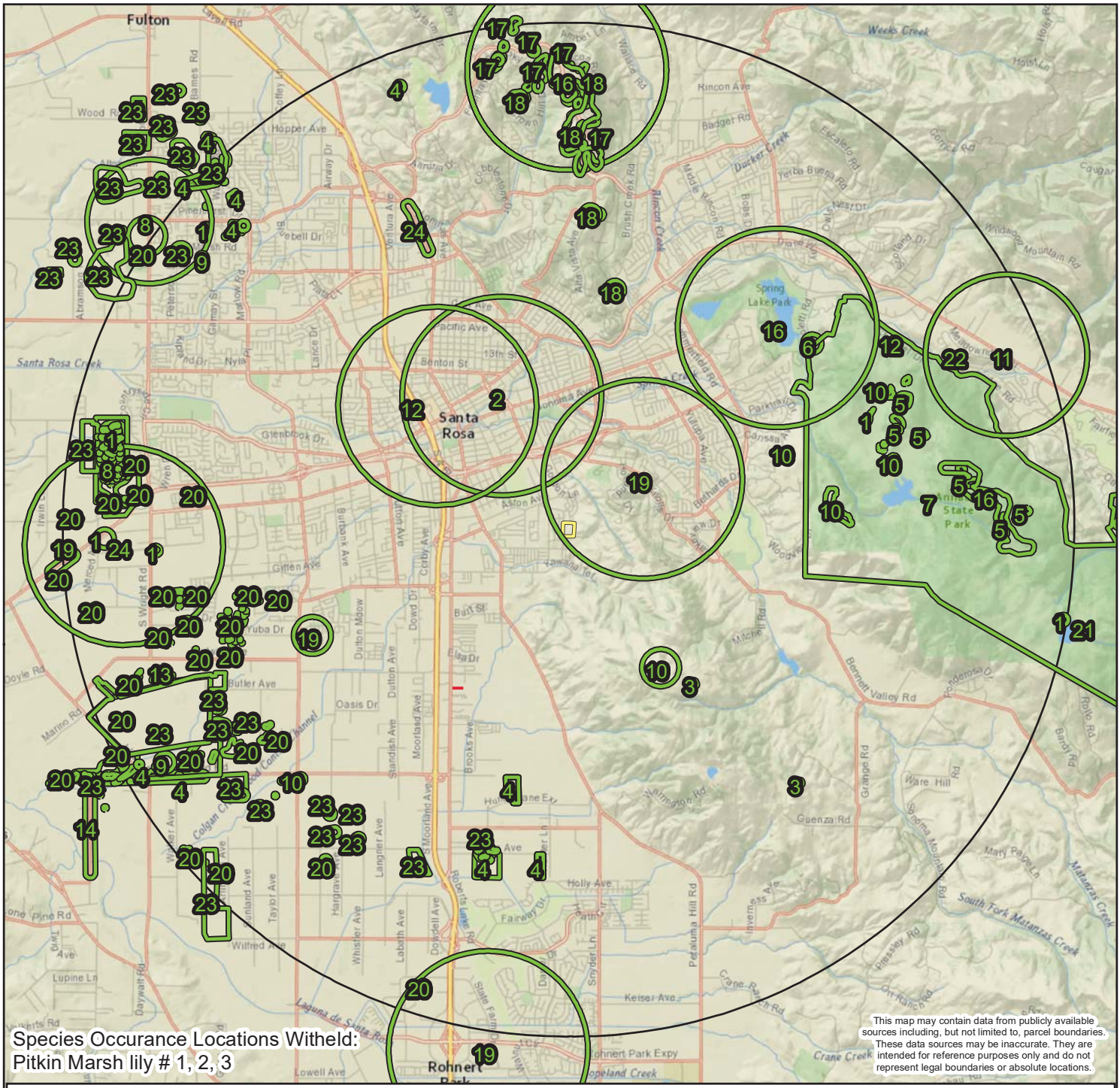
4.3 Special-Status Species

4.3.1 Special-Status Plants

Based upon a review of the resources and databases listed in Section 3.2.1 for the Santa Rosa, Healdsburg, Sebastopol, Two Rock, Cotati, Glen Ellen, Kenwood, Calistoga, and Mark West Springs 7.5-minute USGS quadrangles, it was determined that 89 special-status plant species have been documented from the vicinity of the Project Area; special-status plant species documented from within 5 miles of the site are shown on Figure 3. Of the 89 special-status species known from the region, five were determined to have a moderate potential to occur within the Project Area (Appendix B). The remaining species documented to occur in the vicinity of the Project Area are unlikely or have no potential to occur due to one or more of the following factors:

- The species has a very limited range of endemism and has never been observed in the vicinity of the Project Area;
- Vegetation communities commonly associated with the special-status species (e.g. vernal pools, chaparral, marshes and swamps) are absent from the Project Area;
- Specific edaphic characteristics, such as soil derived from serpentine or volcanic, are absent from the Project Area;
- Specific hydrologic characteristics, such as perennial saline, are absent from the Project Area;
- Very unique pH characteristics, such as alkali scalds or acidic bogs and fens, are absent from the Project Area;
- The disturbance regime (i.e. previous and continued mowing) likely precludes the species from persisting in the Project Area.

All listed plant species covered by the Santa Rosa Plain Conservation strategy, Burke's goldfields, Sonoma sunshine, and Sebastopol meadowfoam are unlikely to occur within the



Project Area (9.70 ac.)
5 Mile Boundary
Plant Species

ID, Common Name

1, Baker's navarretia
2, bent-flowered fiddleneck
3, big-scale balsamroot
4, Burke's goldfields
5, Calistoga ceanothus
6, coastal triquetrella
7, Colusa layia
8, congested-headed hayfield tarplant
9, dwarf downingia
10, fragrant fritillary
11, holly-leaved ceanothus
12, Jepson's leptosiphon
13, legenere
14, marsh microseris
15, Napa false indigo
16, narrow-anthered brodiaea
17, Rincon Ridge ceanothus
18, Rincon Ridge manzanita
19, saline clover
20, Sebastopol meadowfoam
21, Sonoma alopecurus
22, Sonoma ceanothus
23, Sonoma sunshine
24, two-fork clover

Figure 3. Special-Status Plant Species Within 5 Miles of the Project Area

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Miles

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ENVIRONMENTAL CONSULTANTS

Penstemon Place Development Project
Sonoma County, California

Map Prepared Date: 1/9/2017
Map Prepared By: fhourigan
Base Source: Esri Streaming - National Geographic
Data Source(s): WRA, CNDDB (Jan. 2017)

Path: L:\Acad 2000 Files\25000\25096\GIS\ArcMap\CNDDB_Plants.mxd

Project Area due to a lack of vernal pool habitat, lack of suitable hydrology (i.e. extended ponding), prior disturbance (i.e. mowing), and lack of historical occurrences within the immediate proximity (within 2 miles) of the Project Area. Moreover, the Project Area is located in area assessed by the Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007) as "no listed plants in the area". All special-status plant species with a moderate or high potential to occur are discussed below:

Fragrant fritillary (*Fritillaria liliacea*). CNPS Rank 1B. Moderate Potential. Fragrant fritillary is a low-growing, bulbiferous perennial forb in the lily family (Liliaceae) that blooms from February to April. It typically occurs in open, grassy areas in valley and foothill grassland, coastal scrub, and coastal prairie habitat at elevations ranging from 10 to 1,345 feet (CDFW 2017, CNPS 2016b). Soil survey data at known locations suggest that this species is typically located on moderately acid (pH 5.8) to neutral (pH 6.7) clay loams to clays derived from volcanics or serpentine (CDFW 2017, CSRL 2016). This species has a serpentine affinity rank of weak indicator (1.8) (Safford et al. 2005). Observed associated species include soap plant (*Chlorogalum pomeridianum* var. *pomeridianum*), coyote brush (*Baccharis pilularis*), purple needlegrass (*Stipa pulchra*), California oat grass (*Danthonia californica*), large flowered star tulip (*Calochortus uniflorus*), California buttercup (*Ranunculus californicus*), sun cups (*Camissonia ovata*), shooting stars (*Dodecatheon hendersonii*), needleleaf pincushion plant (*Navarretia intertexta*), one-sided bluegrass (*Poa secunda*), and Greene's popcornflower (*Plagiobothrys greenei*) (CDFW 2017).

Fragrant fritillary is known from 38 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Marin, Monterey, San Benito, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma counties (CNPS 2016b). There are ten CNDDB (CDFW 2017) records in greater vicinity of the Project Area, eight CCH (2016) records from Marin County, and six CCH (2016) records from Sonoma County. The nearest documented occurrence is from February 1981, approximately 1.5 miles southeast of the Project Area (CDFW 2017). The most recent documented occurrence is from March 2016, in Annadel State Park, Santa Rosa, Sonoma County, approximately 2.6 miles east of the Project Area (CDFW 2017). Fragrant fritillary has a moderate potential to occur in the grassy areas with low-growing herbs underlain by clay substrate in the Project Area due to the presence of suitable substrate, associated species, and six documented populations within 5 miles of the Project Area.

Congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*). CNPS Rank 1B. Moderate Potential. Congested-headed hayfield tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from April to November. It typically occurs in grassy areas and fallow fields in coastal scrub, and valley and foothill grassland at elevations ranging from 65 to 1,840 feet (CDFW 2017, CNPS 2016b). Observed associated species include coast live oak, white hyacinth (*Triteleia hyacinthina*), Italian rye grass, little rattlesnake grass (*Briza minor*), pennyroyal, and spiny buttercup (CDFW 2017).

Congested-headed hayfield tarplant is known from 23 USGS 7.5-minute quadrangles in Marin, Mendocino, San Francisco, San Mateo, and Sonoma counties (CNPS 2016b). There are 16 CNDDB (CDFW 2017) records in the greater vicinity of the Project Area, 80 CCH (2016) records from Marin County, and 58 CCH (2016) records from Sonoma County. The nearest documented occurrence is from 1994 and is approximately 4.5 miles west of the Project Area. The most recent documented within the vicinity of the Project Area is occurrence is from 2008, and is approximately 4.7 miles north of the Project Area (CDFW 2017). Congested-headed tarplant has a moderate potential to occur in the grassland areas of the Project Area due to the

presence of associated species, suitable substrate, and multiple documented occurrences in relatively close proximity to the Project Area.

Harlequin lotus (*Hosackia gracilis*). CNPS Rank 4. Moderate Potential. Harlequin lotus is a perennial forb in the pea family (Fabaceae) that blooms from March to July. It typically occurs in wetlands or ditches in broadleaf upland forest, coastal scrub, closed-cone coniferous forest, cismontane woodland, coastal prairie, meadow and seep, marsh and swamp, North Coast coniferous forest, and valley and foothill grassland habitat at elevations ranging from 0 to 2,275 feet (CNPS 2016b). This species has a wetland indicator status of facultative wetland (FACW) on the National Wetland Plant List (Lichvar 2016). Observed associated species include tinker's penny (*Hypericum anagalloides*), blue-eyed grass (*Sisyrinchium bellum*), golden-eyed grass (*S. californicum*), bird's-foot trefoil (*Lotus corniculatus*), common velvet grass (*Holcus lanatus*), California oat grass, and silver hair grass (*Aira caryophyllea*).

Harlequin lotus is known from nine USGS 7.5-minute quadrangles in Del Norte, Humboldt, marin, Mendocino, Monterey, San Benito, Santa Cruz, San Francisco, San Luis Obispo, San Mateo, and Sonoma counties (CNPS 2016). There are 37 CCH (2016) records from Marin County, and 22 CCH (2016) records from Sonoma County. The nearest documented occurrence in CCH is approximately 4.9 miles east of the Project Area at Ledson Marsh in Annadel State Park. Harlequin lotus has a moderate potential to occur in the seasonal wetland portions of the Project Area due to the presence of associated species, and vernally mesic hydrology.

Marsh microseris (*Microseris paludosa*). CNPS Rank 1B. Moderate Potential. Marsh Microseris is a perennial forb in the sunflower family (Asteraceae) that blooms from April through July. It typically occurs in closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland habitat at elevations ranging from 15 to 985 feet (CDFW 2017, CNPS 2016b). Observed associated species include coast live oak, coyote brush (*Baccharis pilularis*), English plantain (*Plantago lanceolata*), blue-eyed grass, bracken fern (*Pteridium aquilinum*), rough cat's ear (*Hypochaeris radicata*), common velvet grass (*Holcus lanatus*), little rattlesnake grass, narrow-leaf mule ears (*Wyethia angustifolia*), white hyacinth, and Douglas iris (*Iris douglasiana*) (CDFW 2017).

Marsh microseris is known from 24 USGS 7.5-minute quadrangles in Marin, Mendocino, Monterey, San Benito, Santa Cruz, San Francisco, San Luis Obispo, San Mateo, and Sonoma counties (CNPS 2016b). There are four CNDDB (CDFW 2017) records in the greater vicinity of the Project Area, five CCH (2016) records from Marin County, and four CCH (2016) records from Sonoma County. The nearest documented occurrence is from 1978, near Todd Road, Santa Rosa, Sonoma County, approximately 5.2 miles southwest of the Project Area (CDFW 2017). The most recent documented occurrence is from May 1981, Windsor, Sonoma County approximately 12.2 miles northwest of the Project Area (CDFW 2017). Marsh microseris has a moderate potential to occur in mesic areas within grassland in the Project Area due to the presence of suitable habitat.

Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*). CNPS Rank 4. Moderate Potential. Gairdner's yampah is a perennial forb in the carrot family (Apiaceae) that blooms from June to October. It typically occurs in vernally mesic areas within broadleaf upland forest, chaparral, coastal prairie, valley and foothill grassland, and vernal pool habitat at elevations ranging from 0 to 1985 feet (CNPS 2015, Baldwin et al. 2012). This species is a facultative (FAC) plant (Lichvar 2016), and is known from vernal pool habitat in some regions of California, but is generalist in others (VPA?) (Keeler-Wolf et al. 1998). Observed associated species

include meadow barley, purple needlegrass, dallisgrass (*Paspalum dilatatum*), Kellogg's yampah (*Perideridia kelloggii*), Harlequin lotus, johnny-nip (*Castilleja ambigua* ssp. *ambigua*), and large flowered star tulip (e.g. at Lagunitas Meadows, Marin County, California 2016; Howell et al. 2007).

4.3.2 Special-Status Wildlife

Based upon a review of the resources and databases listed in Section 3.2.1, it was determined that 37 special-status wildlife species have been documented from within the Cotati, Kenwood, Sebastopol, Calistoga, Glen Ellen, Healdsburg, Mark West Springs, Two Rock, and Santa Rosa USGS 7.5-minute quadrangles. Appendix B summarizes the potential for each of these species to occur in the Project Area. Special-status wildlife species that have been documented in CNDDB within a 5-mile radius of the Project Area are depicted in Figure 4.

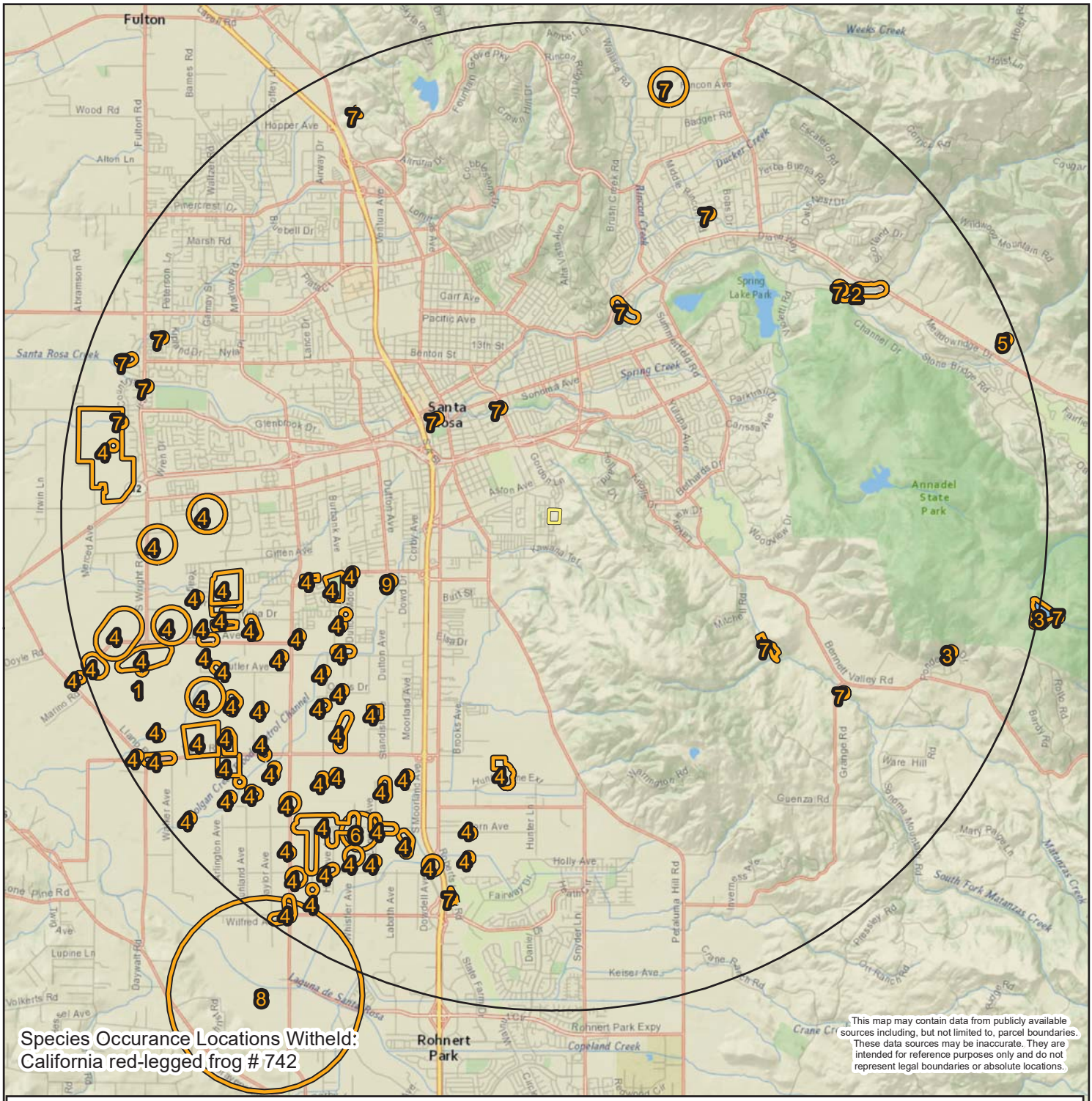
Thirty special-status wildlife species listed in Appendix B were determined to have no potential or are unlikely to occur within the Project Area. The species with no potential to occur within the Project Area require habitat elements completely absent from the site, including streams, ponds, rivers, woodland, riparian, and serpentine habitats. For the species unlikely to occur within the Project Area, some elements of suitable habitat may be present (e.g., grassland or trees potentially suitable for nesting); however, the high disturbance levels near potential nest sites, urbanized nature of the site and surrounding areas, and/or the lack of ground squirrels (and their burrows) reduce the potential for these species to occur and may preclude their presence. Although the Project Area is within the Santa Rosa Plain, CTS is unlikely to occur within the Project Area based upon a lack of breeding, upland, and dispersal habitat; no occurrences within two miles; and dispersal barriers. This region of the Santa Rosa Plain has not been documented as potential habitat for CTS (USFWS 2005, CDFG 2007, USFWS 2016).

Although it is unlikely to occur within the Project Area, the California tiger salamander (*Ambystoma californiense*; CTS) is discussed in further detail below because the species' listed status and consideration within the Santa Rosa Plain Conservation Strategy (USFWS 2005). In addition, the 6 special-status wildlife species with moderate potential to occur within the Project Area and one special-status species observed during the December 21 site visit are discussed below.

<u>Federally Listed Species that Occur in the Region Which are Unlikely to Occur in the Project Area</u>

California Tiger Salamander (*Ambystoma californiense*); Federal Endangered, State Threatened. Unlikely. The California tiger salamander is restricted to grasslands and low-elevation foothill regions in California (generally under 1500 feet) where it uses seasonal aquatic habitats for breeding. The salamander breeds in natural ephemeral pools, or ponds that mimic ephemeral pools (e.g., stock ponds that go dry), and occupy substantial areas surrounding the breeding pool as adults (Stebbins 2003). California tiger salamanders spend most of their time in the grasslands surrounding breeding pools. They survive hot, dry summers by living underground in burrows such as those created by ground squirrels, gophers or other mammals (Holland et al. 1990). They may also use deep cracks or holes in the ground where the soil atmosphere remains near the water saturation point. During wet periods, the salamanders may emerge from refugia and feed in the surrounding grasslands.

The nearest CTS occurrence is over 2 miles southwest of the Project Area (CDFW 2017) and is separated from the Project Area by Highway 101, a complete barrier to CTS dispersal. Although seasonal wetlands occur on-site, they are densely vegetated and dominated by non-



Project Area (9.70 ac.)
5 Mile Boundary
Wildlife Species

ID, Common Name

1, American badger
2, California giant salamander
3, California red-legged frog
4, California tiger salamander
5, pallid bat
6, western bumble bee
7, western pond turtle
8, western yellow-billed cuckoo
9, white-tailed kite

Figure 4. Special-Status Wildlife Species Within 5 Miles of the Project Area

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Miles

wra
ENVIRONMENTAL CONSULTANTS

Penstemon Place Development Project
Sonoma County, California

Map Prepared Date: 1/11/2017
Map Prepared By: fhourigan
Base Source: Esri Streaming - National Geographic
Data Source(s): WRA, CNDDB (Jan. 2017)

Path: L:\Acad 2000 Files\25000\25096\GIS\ArcMap\CNDDB_Wildlife.mxd

native annual grasses with thick thatch accumulation. There is no evidence of extended ponding or water depths within the Project Area sufficient to support breeding by this species. A site visit in December 21, 2016 following significant rainfall confirmed no breeding habitat was present. Upland refugia is also extremely limited within the Project Area. There are no small mammal burrows typically used as upland aestivation habitat within the Project Area.

In 2007, CDFG designated the Project Area and land in the vicinity as a "no effect" area on CTS during development (CDFG 2007). Furthermore, the USFWS defined the Project Area and land in the vicinity as "not identified as a core management area" (USFWS 2016). The increased development in this area since the publishing of these two materials are further evidence that CTS are not in proximity of the Project Area. No breeding, upland, or dispersal habitat is present and this species is not known within 2 miles of the Project Area (USFWS 2005, CDFG 2007, USFWS 2016, CDFW 2017).

In summary, the lack of breeding or aestivation habitat combined with numerous published materials referencing the improbability of CTS using the Project Area ultimately indicate that this species is unlikely to occur within the Project Area or be affected by its development.

Species Present within the Project Area

Nuttall's woodpecker (*Picoides nuttallii*). USFWS Bird of Conservation Concern. Present. Nuttall's Woodpecker, common in much of its range, is a year-round resident throughout most of California west of the Sierra Nevada. Typical habitat is oak or mixed woodland, and riparian areas (Lowther 2000). Nesting occurs in tree cavities, principally those of oaks and larger riparian trees. Nuttall's woodpecker also occurs in older residential settings and orchards where trees provide suitable foraging and nesting habitat. This species forages on a variety of arboreal invertebrates. The Project Area includes suitable trees for foraging and nesting habitat and was observed on the December 21, 2016 site visit. This species is considered present.

Species with a Moderate Potential to Occur in the Project Area

Allen's hummingbird (*Selasphorus sasin*). USFWS Bird of Conservation Concern. Moderate Potential. Allen's hummingbird, common in many portions of its range, is a summer resident along the majority of California's coast and a year-round resident in portions of coastal southern California and the Channel Islands. Breeding occurs in association with the coastal fog belt, and typical habitats used include coastal scrub, riparian, woodland and forest edges, and eucalyptus and cypress groves (Mitchell 2000). It feeds on nectar, as well as insects and spiders. The Project Area is primarily grassland with little foraging potential for this species; however adjacent residential development may provide foraging habitat. Trees present within the Project Area provide potential nesting habitat. Therefore, this species has a moderate potential to occur.

Fringed myotis (*Myotis thysanodes*), WBWG High Priority. Moderate Potential. The fringed myotis ranges through much of western North America from southern British Columbia, Canada, south to Chiapas, Mexico and from Santa Cruz Island in California, east to the Black Hills of South Dakota. This species is found in desert scrubland, grassland, sage-grass steppe, old-growth forest, and subalpine coniferous and mixed deciduous forest. Oak and pinyon-juniper woodlands are most commonly used. The fringed myotis roosts in colonies from 10 to 2,000 individuals, although large colonies are rare. Caves, buildings, underground mines, rock crevices in cliff faces, and bridges are used for maternity and night roosts, while hibernation has only been documented in buildings and underground mines. Tree-roosting has also been documented in Oregon, New Mexico, and California (WBWG 2017).

The Project Area contains an uninhabited residence that was not assessed thoroughly for its potential to provide bat roosting habitat. In addition, nearby forests, streams, and other habitats provide potential foraging habitat. Because some of the habitat components meeting species requirements are present and the species has been documented within the 9-quad radius of the Project Area (CDFW 2017), fringed myotis has a moderate potential to occur.

Long-legged myotis (*Myotis volans*), WBWG High Priority. **Moderate Potential.** The long-legged myotis ranges across western North America from southeastern Alaska to Baja California and east to the Great Plains and central Texas. This species is usually found in coniferous forests, but also occurs seasonally in riparian and desert habitats. They use abandoned buildings, cracks in the ground, cliff crevices, exfoliating tree bark and hollows within snags as summer day roosts. Caves and mines are used as hibernation roosts. Long-legged myotis forage in and around the forest canopy and feed on moths and other soft-bodies insects (WBWG 2017).

The Project Area contains an uninhabited residence that may provide roosting habitat for this species. In addition, nearby forests, streams, and other habitats provide potential foraging habitat. Because some of the habitat components meeting species requirements are present and the species has been documented within the 9-quad radius of the Project Area (CDFW 2017), long-legged myotis has a moderate potential to occur.

Pallid bat (*Antrozous pallidus*), CDFW Species of Special Concern, WBWG High Priority. Moderate Potential. Pallid bats are distributed from southern British Columbia and Montana to central Mexico, and east to Texas, Oklahoma, and Kansas. This species occurs in a number of habitats ranging from rocky arid deserts to grasslands, and into higher elevation coniferous forests. They are most abundant in the arid Sonoran life zones below 6,000 feet, but have been found up to 10,000 feet in the Sierra Nevada. Pallid bats often roost in colonies of between 20 and several hundred individuals. Roosts are typically in rock crevices, tree hollows, mines, caves, and a variety of man-made structures, including vacant and occupied buildings. Tree roosting has been documented in large conifer snags (e.g., ponderosa pine), inside basal hollows of redwoods and giant sequoias, and within bole cavities in oak trees. They have also been reported roosting in stacks of burlap sacks and stone piles. Pallid bats are primarily insectivorous, feeding on large prey that is usually taken on the ground but sometimes in flight. Prey items include arthropods such as scorpions, ground crickets, and cicadas (WBWG 2017).

The Project Area contains an uninhabited residence that may provide roosting habitat for this species. In addition, nearby forests, streams, and other habitats provide potential foraging habitat. Because some of the habitat components meeting species requirements are present and there is a documented occurrence within 5 miles of the Project Area (CDFW 2017), pallid bat has a moderate potential to occur.

Townsend's western big-eared bat, (*Corynorhinus townsendii townsendii*), CDFW Species of Special Concern, WBWG High Priority. Moderate Potential. This species ranges throughout western North America from British Columbia to central Mexico. Its local distribution is strongly associated with the presence of caves, but roosting also occurs within man-made structures including mines and buildings. While many bats species wedge themselves into tight cracks and crevices, big-eared bats hang from walls and ceilings in the open. Males roost singly during the spring and summer months while females aggregate in the spring at maternity roosts to give birth. Females roost with their young until late summer or early fall, until the young become independent, flying and foraging on their own. In central and southern California, hibernation roosts tend to be made up of small aggregations of individuals

(Pierson and Rainey 1998). Foraging typically occurs along edge habitats near streams and wooded areas, where moths are the primary prey (WBWG 2017).

The Project Area contains an uninhabited residence that may provide roosting habitat for this species. In addition, nearby forests, streams, and other habitats provide potential foraging habitat. Because some of the habitat components meeting species requirements are present and the species has been documented within the 9-quad radius of the Project Area (CDFW 2017), Townsend's western big-eared bat has a moderate potential to occur.

Yuma myotis (*Myotis yumanensis*), WBWG Low Priority. Moderate Potential. The Yuma myotis is found throughout most of California at lower elevations in a wide variety of habitats. Day roosts can be found in buildings, trees, mines, caves, bridges, and rock crevices. Night roosts are usually associated with buildings, bridges or other man-made structures (Philpott 1996). The Project Area contains an uninhabited residence that may provide roosting habitat for this species. In addition, nearby forests, streams, and other habitats provide potential foraging habitat. Because some of the habitat components meeting species requirements are present and the species has been documented within the 9-quad radius of the Project Area (CDFW 2017), Yuma myotis has a moderate potential to occur.

5.0 POTENTIAL IMPACTS AND RECOMMENDED AVOIDANCE, MINIMIZATION, AND MITIGAITON MEASURES

5.1 Project Description

The Project proposes to develop 59 new single-family homes on lots ranging in size from 3,200 square feet to 19,300 square feet with an average of 5,900 square feet. Twelve of these new homes are designed as 4-unit auto courts.

The primary site design concept is to create a new walkable neighborhood of single-family homes with interconnected streets which fits with the site and the surrounding adjacent neighborhoods. To this end, the site design connects to Verbena Drive to the north and provides for the extension of Poinsettia Lane into the site from the west. Also, the site design also seeks to save all of the largest valley oaks on the site and incorporate them into the new neighborhood.

An additional goal of the overall site design is to minimize the visual impact of the project. This is planned to be accomplished by grading to tuck the homes into the site. The plans for the future Farmers Lane Extension already call for extensive grading along the easterly boundary of the site. Grading the homes into the site significantly below the elevation of the future Farmers Lane will not only reduce the visual profile but will mitigate the future traffic noise from Farmers Lane without need for sound walls.

5.2 Significance Threshold Criteria

Pursuant to Appendix G, Section IV of the State CEQA Guidelines, a project would have a significant impact on biological resources if it would:

> a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS;

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; and/or,

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

This report utilizes these thresholds in the analysis of impacts and determination of the significance of those impacts. The assessment of impacts under CEQA is based on the changes caused by the Project relative to the existing conditions in the Project Area. The existing conditions in the Project Area are described above, based on surveys conducted in 2015 and 2016. In applying CEQA Appendix G, the terms “substantial” and “substantially” are used as the basis for significance determinations in many of the thresholds, but are not defined qualitatively or quantitatively in CEQA or in technical literature. In some cases, such as direct impacts to special-status species listed under the CESA or ESA, the determination of a substantial impact may be relatively straightforward. In other cases, the determination is less clear, and requires application of best professional judgment based on knowledge of site conditions as well as the ecology and physiology of biological resources present in a given area. Determinations of whether or not Project activities will result in a substantial adverse effect to biological resources are discussed in the following sections for sensitive biological communities, special-status plant species, and special-status wildlife species.

5.3 Potentially Significant Impacts

Two sensitive communities are present within the Project Area (seasonal wetland and perennial wetland). Five special-status plant species were determined to have a moderate or high potential to occur within the Project Area. Six special-status wildlife species were determined to have potential to occur within the Project Area and one special-status species is present. In addition, the Project Area contains several tree species that may qualify as heritage trees and may require a permit for removal. Potential impacts to these sensitive resources associated with the proposed conversion of the site from primarily undeveloped land to a 59-lot subdivision of new single-family residential homes are discussed below. Recommended avoidance, minimization, and mitigation measures to reduce such impacts are also included.

5.3.1 Sensitive Biological Communities

Impact BIO-1: Impacts to Seasonal and Perennial Wetlands

The Project Area contains 1.41 acres of seasonal wetland 0.05 acre of perennial wetland which are potentially within the jurisdiction of the Corps under Section 404 of the Clean Water Act and

RWQCB under the Porter Cologne Act and Section 401 of the Clean Water Act. The proposed development will convert all 1.46 acres of wetlands to developed land. Potential mitigation measures for these impacts are discussed below in Section 5.2.

Impact BIO-2: Removal of Heritage Trees

A comprehensive tree survey was conducted by an ISA-Certified Arborist for the Project (Duckles 2017). The Project would result in the removal of approximately 33 heritage trees which are protected under the City of Santa Rosa Tree Ordinance. As described above, the Project has been designed to retain the largest mature valley oak and coast live oak trees on site and to incorporate these trees into the Project design. The Project will obtain a tree removal permit from the City prior to the removal of any protected or heritage trees. As such, this impact would not conflict with local policies or ordinances (CEQA significance criterion E). Mitigation measures associated with the Ordinance are summarized below in Section 5.4 (see MM BIO-2). With implementation of MM BIO-2 this impact would be less than significant.

5.3.2 Special-Status Plant Species

Impact BIO-3: Potential Impacts to Special-status Plant Species

Five special-status plant species, fragrant fritillary, congested-headed hayfield tarplant, Harlequin lotus, marsh microseris, and Gairdner's yampah were determined to have a moderate potential to occur within the Project Area. Fragrant fritillary, congested-headed tarplant, and marsh microseris are all CNPS Rank 1B species, meaning that they are considered rare, threatened or endangered in throughout their range in California, and they must be considered under CEQA. In contrast, Harlequin lotus and Gairdner's yampah both carry a CNPS Rank 4.2. According to the CNPS guidelines (CNPS 2016b), few, if any, Rank 4 species are eligible for state listing under CESA; however, impacts may be considered significant under CEQA in special cases. Examples of impacts that may be considered significant under CEQA include:

- Impacts to the type locality of a California Rare Plant Rank 4 plant;
- Impacts to populations at the periphery of a species' range;
- Impacts in areas where the taxon is especially uncommon;
- Impacts in areas where the taxon has sustained heavy losses; or
- Impacts to populations exhibiting unusual morphology or occurring on unusual substrates.

If present in the Project Area, impacts to the aforementioned special-status plant species could be significant under CEQA (criterion A). A mitigation measure (MM BIO-2) for impacts to special-status plant species is discussed below in Section 5.4. With implementation of MM BIO-1 this impact would be less than significant.

5.3.3 Special-Status Wildlife Species

Six special-status wildlife species were determined to have potential to occur within the Project Area and one special-status species is present. Additionally, the Project may affect non-special-status native nesting birds which are protected by the MBTA and CFGC.

Impact BIO-4: Special-Status and Nesting Bird Species

The Project may affect nesting by Allen's hummingbird, Nuttall's woodpecker, and non-special-status birds protected by MBTA and CFGC by modifying nesting habitat, or by causing disturbance of a sufficient level to cause abandonment of an active nest. Potential impacts to these species and their habitats could occur during the removal of vegetation and structures, grading, or ground-disturbing activities. These activities could result in the direct removal or destruction of the active nests of protected bird species. These activities may also create audible, vibratory and/or visual disturbances which cause birds to abandon active nests.

Activities that result in the direct removal of active nests or disturbance to breeding birds sufficient to result in the abandonment of active nests would be potentially significant under CEQA. A potential mitigation measure (MM BIO-4) for impacts to nesting birds is discussed below in Section 5.4.3. With implementation of MM BIO-4 this impact would be less than significant.

Impact BIO-5: Special-Status Bat Species

The Project Area contains uninhabited buildings that may provide roost structures to bat species documented in the vicinity and outlined in Appendix B: fringed myotis, long-legged myotis, pallid bat, Townsend's big-eared bat, and Yuma myotis. At the time of the site visit, the building was boarded at typical points of entry. However, bats are known to use buildings' relatively small entry and egress points that the initial site visit did not assess. The planned demolition of these buildings could potentially impact bat species that may use them as a roost. Potential impacts to these species and their roost habitats could occur during the removal of structures. These activities could result in the direct removal or destruction of the maternity roost. These activities may also create audible, vibratory and/or visual disturbances which cause maternity roosting bats to abandon their roost site.

Activities that result in the direct removal of active roosts or disturbance to maternity roosting bats sufficient to result in the abandonment of the roost would be potentially significant under CEQA. A potential mitigation measure (MM BIO-5) for impacts to roosting bats is discussed below in Section 5.4.3. With implementation of MM BIO-5 this impact would be less than significant.

5.4 Recommended Avoidance, Minimization, and Mitigation Measures

5.4.1 Sensitive Biological Communities

MM BIO-1: Compensatory Mitigation for Impacts to Seasonal and Perennial Wetlands

The wetland delineation report (WRA 2015) shall be submitted to the Corps for verification. A permit from the Corps, RWQCB, and/or CDFW may be required to fill the 1.41 acres of seasonal wetland and 0.05 acre of perennial wetland (1.46 acres total) in the Project Area. Impacts to seasonal and perennial wetland features will be fully mitigated at a minimum 1:1 ratio on a functions and values basis ("no net loss"); however, the final wetland mitigation requirements will be determined by the regulatory agencies during the permitting process. Required mitigation ratios can be met by creating wetlands on-site or off-site (may require a higher than 1:1 replacement to impacts ratio) or purchasing wetland credits (1:1 ratio) from a wetland mitigation bank. Implementation of these compensatory mitigation measures will reduce wetland impacts to less-than-significant levels.

MM BIO-2: Compensatory Mitigation for Tree Removal

The City of Santa Rosa Tree Ordinance requires that development proposals and subdivision applications preserve and protect heritage trees to the greatest extent feasible. As described above, the Project will preserve the largest valley oak heritage trees on site (five valley oaks in total ranging from 13 to 39 inch DBH). An additional three coast live oak heritage trees in excellent condition will be preserved and incorporated into the new development.

A tree removal permit shall be obtained from the City of Santa Rosa for any alteration, removal or relocation of any tree including heritage, protected or street tree. The City of Santa Rosa may require replacement plantings as a condition of approval in order to mitigate for the loss of functions provided by trees to be removed including shade, erosion control, groundwater replenishment, visual screening, and wildlife habitat. Replacement trees shall be planted in accordance with the following criteria stated in the Ordinance:

- For each 6 inches or fraction thereof of the diameter of a tree which was approved for removal, two trees of the same genus and species as the removed tree (or another species, if approved by the City), each of a minimum 15-gallon container size, shall be planted on the project site, provided however, that an increased number of smaller size trees of the same genus and species may be planted if approved by the City, or a fewer number of such trees of a larger size if approved by the City.
- If the development site is inadequate in size to accommodate the replacement trees, the trees shall be planted on public property with the approval of the Director of the City's Recreation and Parks Department. Upon the request of the developer and the approval of the Director, the City may accept an in-lieu payment of $100.00 per 15-gallon replacement tree on condition that all such payments shall be used for tree-related educational projects and/or planting programs of the City.

Additional tree protection measures provided by the Project's Arborist in order to minimize impacts to protected trees selected for preservation are as follows:

- A consulting arborist will be present during work done within their driplines to assess how many roots are encountered that must be cut. A note stating this will be printed on construction plans to alert the contractors and supervisors to schedule the arborist. If the trees are deemed by the arborist to be unstable or hazardous after that work they will be removed and mitigated.
- Tree protection fencing will be installed at the outer edge of the protected tree driplines prior to construction, or at the limit of required access on Linwood.
- Project landscape architects are providing a list of trees to be removed with mitigation calculations. Locations, species and sizes of mitigation trees are shown on project landscape plans.

Implementation of these compensatory mitigation measures will reduce tree removal impacts to less-than-significant levels.

5.4.2 Special-Status Plant Species

Of the 89 special-status plant species known to occur in the vicinity of the Project Area, only five species, fragrant fritillary, congested-headed hayfield tarplant, Harlequin lotus, and Gairdner's yampah were determined to have a moderate potential to occur in the Project Area. None of the listed species covered by the Santa Rosa Plain have potential to occur in the Project Area due to a lack of vernal pool habitat, lack of suitable hydrology (i.e. extended ponding), prior disturbance (i.e. mowing), and lack of historical occurrences within the immediate proximity of the Project Area. Moreover, the Project Area is located in area assessed by the Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007) as "no listed plants in the area".

- Due to the potentially suitable seasonal wetland and grassland habitats within the Project Area, focused, protocol-level rare plant surveys are recommended for all areas that are not mapped as developed/disturbed, including seasonal wetland, perennial wetland, and non-native annual grassland.

- Surveys should focus on those species with a moderate potential to occur in the Project Area, and should include protocol-level surveys covering the documented bloom periods of the species. Three site visits, including two early-season (March and April), and one late-season (June or July) would be sufficient to cover the bloom periods of the five species with potential to occur, and although the Santa Rosa Plain listed species are unlikely to occur, these surveys would be sufficient in timing to confirm absence of those species.

If special-status plant surveys result in negative findings, no impacts would occur, and no mitigation would be required. However, if special-status plants are identified in the impact area, mitigation may be required. Mitigation may include avoidance, or if avoidance is not feasible, seeds collection and re-establishment at a minimum 1:1 ratio (number of plant established: number of plants impacted) in preserved, suitable habitat. Re-established populations shall be monitored annually in accordance with an approved HMMP for a minimum of five years.

Although the three listed Santa Rosa Plain plant species, Burke's goldfields, Sonoma sunshine, and Sebastopol meadowfoam are unlikely to occur within the Project Area, if any of these species were encountered during special-status plant surveys, they would require avoidance and/or mitigation under the Santa Rosa Plain PBO. The implementation of these measures will reduce special-status plant impacts to less-than-significant levels.

5.4.3 Special-Status Wildlife Species

30 special-status wildlife species known to occur in the vicinity of the Project Area have no potential to occur or are unlikely to occur within the Project Area. However, the Project Area could potentially provide bat roosting habitat for five special-status bat species and nesting habitat for two special-status birds and non-status nesting birds protected by the MBTA and CFGC. Mitigation measures to reduce impacts to these species to less than significant levels are described below.

MM BIO-4: Special-Status and Nesting Birds Species

WRA recommends the following measures be implemented to avoid impacts to Allen's hummingbird, Nuttall's woodpecker, and nesting birds protected by the MBTA and CFGC.

- If ground disturbance or vegetation removal is initiated in the non-breeding season (September 1 through January 31), no pre-construction surveys for nesting birds are required and no adverse impact to birds would result.
- If ground disturbance or removal of vegetation occurs in the breeding bird season (February 1 through August 31), pre-construction surveys should be performed by a qualified biologist no more than 14 days prior to commencement of such activities to determine the presence and location of nesting bird species. If active nests are present, establishment of temporary no-work buffers around active nests will prevent adverse impacts to nesting birds. Appropriate buffer distance should be determined by a qualified biologist and is dependent on species, surrounding vegetation, and topography. Once active nests become inactive, such as when young fledge the nest or the nest is subject to predation, work may continue in the buffer area and no adverse impact to birds will result.

The implementation of the above measures will reduce impacts to protected nesting bird species to less-than-significant levels.

MM BIO-5: Special-Status Bat Species

WRA recommends the following measures be implemented to avoid impacts to special-status bat species:

- *Pre-construction roost assessment survey:* A qualified biologist should conduct a roost assessment survey of uninhabited residences located within the Project Area. The survey will assess use of the structure for roosting as well as potential presence of bats. If the biologist finds no evidence of, or potential to support bat roosting, no further measures are recommended. If evidence of bat roosting is present, additional measures described below should be implemented:

    - *Work activities outside the maternity roosting season*: If evidence of bat roosting is discovered during the pre-construction roost assessment and demolition is planned August 1 through February 28 (outside the bat maternity roosting season), a qualified biologist should implement passive exclusion measures to prevent bats from re-entering the structures. After sufficient time to allow bats to escape and a follow-up survey to determine if bats have vacated the roost, demolition may continue and impacts to special-status bat species will be avoided.

    - *Work activities during the maternity roosting season:* If a pre-construction roost assessment discovers evidence of bat roosting in the uninhabited residences during the maternity roosting season (March 1 through July 31), and determines maternity roosting bats are present, demolition of maternity roost structures will be avoided during the maternity roosting season or until a qualified biologist determines the roost has been vacated.

The implementation of the above measures will reduce impacts to special-status bat species to less-than-significant levels.

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APPENDIX A

LIST OF OBSERVED PLANT AND WILDLIFE SPECIES

Appendix A-1. Plant Species Observed in the Study Area on December 21, 2016.

Family	Scientific Name	Common Name	Origin	Form	Rarity Status[1]	CAL-IPC Status[2]
Agavaceae	*Chlorogalum pomeridianum*	Amole	native	perennial herb	-	-
Apiaceae	*Foeniculum vulgare*	Fennel	non-native (invasive)	perennial herb	-	High
Apocynaceae	*Nerium oleander*	Oleander	non-native (invasive)	tree	-	-
Araliaceae	*Hedera helix*	English ivy	non-native (invasive)	vine, shrub	-	-
Arecaceae	*Syagrus romanzoffiana*	Queen palm	non-native	tree	-	-
Arecaceae	*Washingtonia robusta*	Washington fan palm	non-native (invasive)	tree	-	Moderate
Asteraceae	*Baccharis pilularis*	Coyote brush	native	shrub	-	-
Asteraceae	*Helminthotheca echioides*	Bristly ox-tongue	non-native (invasive)	annual, perennial herb	-	Limited
Asteraceae	*Senecio vulgaris*	Common groundsel	non-native	annual herb	-	-
Asteraceae	*Sonchus oleraceus*	Sow thistle	non-native	annual herb	-	-
Brassicaceae	*Hirschfeldia incana*	Mustard	non-native (invasive)	perennial herb	-	Moderate
Brassicaceae	*Raphanus sativus*	Wild radish	non-native (invasive)	annual, biennial herb	-	Limited

Family	Scientific Name	Common Name	Origin	Form	Rarity Status[1]	CAL-IPC Status[2]
Cactaceae	*Opuntia ficus-indica*	Tuna	non-native	shrub (stem succulent)	-	-
Cupressaceae	*Juniperus sp.*	Juniper	non-native	shrub	-	-
Cyperaceae	*Cyperus eragrostis*	Tall cyperus	native	perennial grasslike herb	-	-
Fabaceae	*Vicia sativa*	Spring vetch	non-native	annual herb, vine	-	-
Fagaceae	*Quercus agrifolia*	Coast live oak	native	tree	-	-
Fagaceae	*Quercus lobata*	Valley oak	native	tree	-	-
Geraniaceae	*Erodium botrys*	Big heron bill	non-native (invasive)	annual herb	-	-
Geraniaceae	*Erodium cicutarium*	Coastal heron's bill	non-native (invasive)	annual herb	-	Limited
Geraniaceae	*Geranium dissectum*	Wild geranium	non-native (invasive)	annual herb	-	Limited
Juglandaceae	*Juglans hindsii*	Northern California black walnut	native	tree	Rank 1B.1*	-
Juncaceae	*Juncus xiphioides*	Iris leaved rush	native	perennial grasslike herb	-	-
Lamiaceae	*Mentha pulegium*	Pennyroyal	non-native (invasive)	perennial herb	-	Moderate
Laxmanniaceae	*Cordyline australis*	Cabbage tree	non-native (invasive)	tree	-	Limited

Family	Scientific Name	Common Name	Origin	Form	Rarity Status[1]	CAL-IPC Status[2]
Moraceae	*Morus alba*	Mulberry	non-native	tree	-	-
Papaveraceae	*Eschscholzia californica*	California poppy	native	annual, perennial herb	-	-
Plantaginaceae	*Plantago lanceolata*	Ribwort	non-native (invasive)	perennial herb	-	Limited
Platanaceae	*Platanus × acerifolia*	London plane	non-native	tree	-	-
Poaceae	*Avena barbata*	Slim oat	non-native (invasive)	annual, perennial grass	-	Moderate
Poaceae	*Bromus diandrus*	Ripgut brome	non-native (invasive)	annual grass	-	Moderate
Poaceae	*Bromus hordeaceus*	Soft chess	non-native (invasive)	annual grass	-	Limited
Poaceae	*Festuca perennis*	Italian rye grass	non-native	annual, perennial grass	-	-
Poaceae	*Hordeum brachyantherum*	Meadow barley	native	perennial grass	-	-
Poaceae	*Hordeum marinum* ssp. *gussoneanum*	Mediterranean barley	non-native (invasive)	annual grass	-	Moderate
Poaceae	*Hordeum murinum*	Mouse barley	non-native (invasive)	annual grass	-	Moderate
Poaceae	*Paspalum dilatatum*	Dallis grass	non-native	perennial grass	-	-

Family	Scientific Name	Common Name	Origin	Form	Rarity Status[1]	CAL-IPC Status[2]
Poaceae	*Phalaris aquatica*	Harding grass	non-native (invasive)	perennial grass	-	Moderate
Polygonaceae	*Rumex pulcher*	Fiddle dock	non-native	perennial herb	-	-
Ranunculaceae	*Ranunculus muricatus*	Spiny buttercup	non-native	annual, perennial herb	-	-
Rosaceae	*Prunus cerasifera*	Cherry plum	non-native (invasive)	tree	-	Limited
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	non-native (invasive)	shrub	-	High
Salicaceae	*Salix lasiolepis*	Arroyo willow	native	tree, shrub	-	-
Typhaceae	*Typha latifolia*	Broadleaf cattail	native	perennial herb (aquatic)	-	-

* CNPS rarity status only applies to native occurrences which are not found in the Project Area (CNPS 2016b). This species has been widely planted throughout California.

All species identified using the *Jepson Manual II: Vascular Plants of California* (Baldwin et al. 2012) and *Jepson eFlora* (Jepson Flora Project [eds.] 2017); Nomenclature follows *Jepson eFlora*.

[1]Rare Status: The CNPS Inventory of Rare and Endangered Plants (CNPS 2016b)

FE:	Federal Endangered
FT:	Federal Threatened
SE:	State Endangered
ST:	State Threatened
SR:	State Rare
Rank 1A:	Plants presumed extirpated in California and either rare or extinct elsewhere
Rank 1B:	Plants rare, threatened, or endangered in California and elsewhere
Rank 2A:	Plants presumed extirpated in California, but more common elsewhere
Rank 2B:	Plants rare, threatened, or endangered in California, but more common elsewhere

Rank 3: Plants about which we need more information – a review list
Rank 4: Plants of limited distribution – a watch list

[2]Invasive Status: California Invasive Plant Inventory (Cal-IPC 2016)
High: Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate: Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited-moderate distribution ecologically
Limited: Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Assessed: Assessed by Cal-IPC and determined to not be an existing current threat

Table A-2. Wildlife Species Observed in the Study Area on December 21, 2016

Common Name (status if applicable)	**Species**
BIRDS	
acorn woodpecker	*Melanerpes formicivorus*
Anna's hummingbird	*Calypte anna*
Nuttall's woodpecker *	*Picoides nuttallii*
white-breasted nuthatch	*Sitta carolinensis*

* USFWS Birds of conservation concern (special-status species)

APPENDIX B

POTENTIAL FOR SPECIAL-STATUS PLANT AND WILDLIFE SPECIES TO OCCUR IN THE PROJECT AREA

Appendix B. Potential Special-Status Plant and Wildlife Species Table. Special- status plant and wildlife species table with the potential to occur within the vicinity of the Project Area (Santa Rosa, Healdsburg, Sebastopol, Two Rock, Cotati, Glen Ellen, Kenwood, Calistoga, and Mark West Springs USGS 7.5' topographic quadrangles) Results include database searches of California Native Plant Society (CNPS) Rare and Endangered Plant Inventory, California Natural Diversity Database (CNDDB, CDFW) as well as U.S. Fish and Wildlife Service Threatened and Endangered Species Lists and Santa Rosa Plain Conservation Strategy (2005), Santa Rosa Plain Programmatic Biological Opinion (2007).

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Franciscan onion *Allium peninsulare* var. *franciscanum*	Rank 1B.2	Cismontane woodland, valley and foothill grassland/clay, volcanic, often serpentine. Elevation ranges from 170 to 980 feet. Blooms (Apr), May-Jun.	**No Potential.** The Project Area lacks volcanic and serpentine substrates known to support this species.	No further recommendations for this species.
Sonoma alopecurus *Alopecurus aequalis* var. *sonomensis*	FE, Rank 1B.1	Marshes and swamps (freshwater), riparian scrub. Elevation ranges from 20 to 1200 feet. Blooms May-Jul.	**Unlikely.** The Project Area lacks large, intact perennial marshes and swamps known to support this species.	No further recommendations for this species.
Napa false indigo *Amorpha californica* var. *napensis*	Rank 1B.2	Broadleafed upland forest (openings), chaparral, cismontane woodland. Elevation ranges from 390 to 6560 feet. Blooms Apr-Jul.	**No Potential.** The Project Area lacks suitable habitat for this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
bent-flowered fiddleneck *Amsinckia lunaris*	Rank 1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland. Elevation ranges from 10 to 1640 feet. Blooms Mar-Jun.	**Unlikely.** Despite potentially suitable grassland habitat, previous and ongoing disturbance within the Project Area likely precludes this species. There is only one historic occurrence of this species within the Project Area vicinity from 1940 (CDFW 2017).	No further recommendations for this species.
slender silver moss *Anomobryum julaceum*	Rank 4.2	Broadleafed upland forest, lower montane coniferous forest, north coast coniferous forest/damp rock and soil on outcrops, usually on roadcuts. Elevation ranges from 330 to 3280 feet.	**No Potential.** The Project Area lacks suitable habitat for this species.	No further recommendations for this species.
Vine Hill manzanita *Arctostaphylos densiflora*	SE, Rank 1B.1	Chaparral (acid marine sand). Elevation ranges from 160 to 390 feet. Blooms Feb-Apr.	**No Potential.** The Project Area lacks chaparral and acidic marine sand substrate known to support this species.	No further recommendations for this species.
Rincon Ridge manzanita *Arctostaphylos stanfordiana* ssp. *decumbens*	Rank 1B.1	Chaparral (rhyolitic), cismontane woodland. Elevation ranges from 250 to 1210 feet. Blooms Feb-Apr (May).	**No Potential.** The Project Area lacks chaparral and rhyolitic substrate known to support this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Brewer's milk-vetch *Astragalus breweri*	Rank 4.2	Chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland (open, often gravelly)/often serpentine, volcanic. Elevation ranges from 300 to 2400 feet. Blooms Apr-Jun.	**Unlikely.** Despite potentially suitable grassland habitat, the Project Area lacks gravelly soils derived from serpentine or volcanic substrate.	No further recommendations for this species.
Clara Hunt's milk-vetch *Astragalus claranus*	FE, ST, Rank 1B.1	Chaparral (openings), cismontane woodland, valley and foothill grassland/serpentine or volcanic, rocky, clay. Elevation ranges from 250 to 900 feet. Blooms Mar-May.	**No Potential.** The Study Area lacks serpentine or volcanic substrates known to support this species	No further recommendations for this species.
big-scale balsamroot *Balsamorhiza macrolepis*	Rank 1B.2	Chaparral, cismontane woodland, valley and foothill grassland/sometimes serpentine. Elevation ranges from 300 to 5100 feet. Blooms Mar-Jun.	**Unlikely.** The Project Area lacks chaparral, cismontane woodland and serpentine substrates associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Sonoma sunshine *Blennosperma bakeri*	FE, SE, Rank 1B.1	Valley and foothill grassland (mesic), vernal pools. Elevation ranges from 30 to 360 feet (10 to 110 meters). Blooms Mar-May.	**Unlikely.** The Project Area lacks vernal pools known to support this species. Seasonal wetlands within the Project Area are relatively disturbed and dominated by non-native annual grasses which likely outcompete many native annual forb species. The Project Area is located in area assessed by the Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007) as "no listed plants in the area".	No further recommendations for this species.
narrow-anthered brodiaea *Brodiaea leptandra*	Rank 1B.2	Broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland/volcanic. Elevation ranges from 360 to 3000 feet. Blooms May-Jul.	**No Potential.** The Project Area lacks gravelly soils composed of volcanics.	No further recommendations for this species.
Bolander's reed grass *Calamagrostis bolanderi*	Rank 4.2	Bogs and fens, broadleafed upland forest, closed-cone coniferous forest, coastal scrub, meadows and seeps (mesic), marshes and swamps (freshwater), north coast coniferous forest/mesic. Elevation ranges from 0 to 1490 feet. Blooms May-Aug.	**Unlikely.** The Project Area lacks the biological communities associated with this species. This species is more closely associated with coastal environments (Jepson eFlora 2017).	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Thurber's reed grass *Calamagrostis crassiglumis*	Rank 2B.1	Coastal scrub (mesic), marshes and swamps (freshwater). Elevation ranges from 30 to 200 feet. Blooms May-Aug.	**Unlikely.** The Project Area lacks coastal scrub and large intact marshes and swamps associated with this species.	No further recommendations for this species.
serpentine reed grass *Calamagrostis ophiditis*	Rank 4.3	Chaparral (open, often north-facing slopes), lower montane coniferous forest, meadows and seeps, valley and foothill grassland/serpentine, rocky. Elevation ranges from 300 to 3490 feet. Blooms Apr-Jul.	**No Potential.** The Project Area lacks serpentine substrate known to support this species.	No further recommendations for this species.
pink star-tulip *Calochortus uniflorus*	Rank 4.2	Coastal prairie, coastal scrub, meadows and seeps, north coast coniferous forest. Elevation ranges from 30 to 3510 feet. Blooms Apr-Jun.	**Unlikely.** Despite potentially suitable grassland habitat, grasslands within the Project Area are relatively disturbed and dominated by non-native annual grasses that tend to outcompete small native perennial forbs such as this species.	No further recommendations for this species.
Mt. Saint Helena morning-glory *Calystegia collina* ssp. *oxyphylla*	Rank 4.2	Chaparral, lower montane coniferous forest, valley and foothill grassland/serpentine. Elevation ranges from 920 to 3310 feet. Blooms Apr-Jun.	**No Potential.** The Project Area lacks serpentine substrates known to support this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
swamp harebell *Campanula californica*	Rank 1B.2	Bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, marshes and swamps (freshwater), north coast coniferous forest/mesic. Elevation ranges from 0 to 1330 feet. Blooms Jun-Oct.	**Unlikely.** The Project Area lacks the biological communities associated with this species. This species is more closely associated with coastal environments (Jepson eFlora 2017).	No further recommendations for this species.
johnny-nip *Castilleja ambigua* ssp. *ambigua*	Rank 4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools margins. Elevation ranges from 0 to 1430 feet. Blooms Mar-Aug.	**Unlikely.** Despite potentially suitable mesic grassland habitat, grasslands within the Project Area have been previously disturbed by mowing and they are dominated by non-native annual grasses with dense thatch accumulation, likely outcompeting many annual native forbs such as this species.	No further recommendations for this species.
Pitkin Marsh paintbrush *Castilleja uliginosa*	SE, Rank 1A	Marshes and swamps (freshwater). Elevation ranges from 790 to 790 feet (240 to 240 meters). Blooms Jun-Jul.	**No Potential.** The Project Area lacks large intact marshes and swamps known to support this species. This species was only known from Pitkin Marsh in Sebastapol, and is now presumed extinct (CNPS 2016b).	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Rincon Ridge ceanothus *Ceanothus confusus*	Rank 1B.1	Closed-cone coniferous forest, chaparral, cismontane woodland/volcanic or serpentine. Elevation ranges from 250 to 3490 feet. Blooms Feb-Jun.	**No Potential.** The Project Area lacks the vegetation communities and substrates known to support this species.	No further recommendations for this species.
Calistoga ceanothus *Ceanothus divergens*	Rank 1B.2	Chaparral (serpentine or volcanic, rocky). Elevation ranges from 560 to 3120 feet. Blooms Feb-Apr.	**No Potential.** The Project Area lacks chaparral and substrates known to support this species.	No further recommendations for this species.
Vine Hill ceanothus *Ceanothus foliosus* var. *vineatus*	Rank 1B.1	Chaparral. Elevation ranges from 150 to 1000 feet. Blooms Mar-May.	**No Potential.** The project area lacks chaparral habitat.	No further recommendations for this species.
glory brush *Ceanothus gloriosus* var. *exaltatus*	Rank 4.3	Chaparral. Elevation ranges from 100 to 2000 feet. Blooms Mar-Jun (Aug).	**No Potential.** The Project Area lacks chaparral habitat.	No further recommendations for this species.
holly-leaved ceanothus *Ceanothus purpureus*	Rank 1B.2	Chaparral, cismontane woodland/volcanic, rocky. Elevation ranges from 390 to 2100 feet. Blooms Feb-Jun.	**No Potential.** The Project Area lacks chaparral and woodland habitats and volcanic substrates.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Sonoma ceanothus *Ceanothus sonomensis*	Rank 1B.2	Chaparral (sandy, serpentine or volcanic). Elevation ranges from 710 to 2620 feet. Blooms Feb-Apr.	**No Potential.** The Project Area lacks chaparral and substrates known to support this species.	No further recommendations for this species.
pappose tarplant *Centromadia parryi* ssp. *parryi*	Rank 1B.2	Chaparral, coastal prairie, meadows and seeps, marshes and swamps (coastal salt), valley and foothill grassland (vernally mesic)/often alkaline. Elevation ranges from 0 to 1380 feet. Blooms May-Nov.	**No Potential.** The Project Area lacks alkaline soils known to support this species.	No further recommendations for this species.
Sonoma spineflower *Chorizanthe valida*	FE, SE, Rank 1B.1	Coastal prairie (sandy). Elevation ranges from 30 to 1000 feet (10 to 305 meters). Blooms Jun-Aug.	**No Potential.** The Project Area lacks coastal prairie and sandy soils.	No further recommendations for this species.
Brewer's clarkia *Clarkia breweri*	Rank 4.2	Chaparral, cismontane woodland, coastal scrub/often serpentine. Elevation ranges from 710 to 3660 feet (215 to 1115 meters). Blooms Apr-Jun.	**No Potential.** The Project Area lacks the vegetation communities and serpentine soils associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Vine Hill clarkia *Clarkia imbricata*	FE, SE, Rank 1B.1	Chaparral, valley and foothill grassland/acidic sandy loam. Elevation ranges from 160 to 250. Blooms Jun-Aug.	**No Potential.** The Project Area lacks chaparral and acidic sandy loam soils. This species is only known from two extant occurrences in the Vine Hill area north of Graton (CNPS 2016b).	No further recommendations for this species.
serpentine bird's-beak *Cordylanthus tenuis* ssp. *brunneus*	Rank 4.3	Closed-cone coniferous forest, chaparral, cismontane woodland/usually serpentine. Elevation ranges from 1560 to 3000 feet. Blooms Jul-Aug.	**No Potential.** The Project Area lacks the associated vegetation communities and serpentine substrates.	No further recommendations for this species.
Pennell's bird's-beak *Cordylanthus tenuis* ssp. *capillaris*	FE, SR, Rank 1B.2	Closed-cone coniferous forest, chaparral/serpentine. Elevation ranges from 150 to 1000 feet. Blooms Jun-Sep.	**No Potential.** The Project Area lacks the associated vegetation communities and serpentine substrates.	No further recommendations for this species.
Peruvian dodder *Cuscuta obtusiflora* var. *glandulosa*	Rank 2B.2	Marshes and swamps (freshwater). Elevation ranges from 50 to 920 feet. Blooms Jul-Oct.	**Unlikely.** The Project Area lacks large intact marsh habitat and many of the host plants preferred by this species (Jepson eFlora 2017). There is only one occurrence in the Project Area vicinity from 1946 (CDFW 2017).	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
mountain lady's-slipper *Cypripedium montanum*	Rank 4.2	Broadleafed upland forest, cismontane woodland, lower montane coniferous forest, north coast coniferous forest. Elevation ranges from 610 to 7300 feet. Blooms Mar-Aug.	**No Potential.** The Project Area lacks the vegetation communities associated with this species.	No further recommendations for this species.
Baker's larkspur *Delphinium bakeri*	FE, SE, Rank 1B.1	Broadleafed upland forest, coastal scrub, valley and foothill grassland/decomposed shale, often mesic. Elevation ranges from 260 to 1000 feet. Blooms Mar-May.	**No Potential.** The Study Area lacks the associated vegetation communities and decomposed shale substrates.	No further recommendations for this species.
golden larkspur *Delphinium luteum*	FE, SR, Rank 1B.1	Chaparral, coastal prairie, coastal scrub/rocky. Elevation ranges from 0 to 330 feet. Blooms Mar-May.	**No Potential.** The Project Area lacks the associated vegetation communities and rocky substrates.	No further recommendations for this species.
dwarf downingia *Downingia pusilla*	Rank 2B.2	Valley and foothill grassland (mesic), vernal pools. Elevation ranges from 0 to 1460 feet. Blooms Mar-May.	**Unlikely.** The Project Area lacks vernal pools associated with this species.	No further recommendations for this species.
streamside daisy *Erigeron biolettii*	Rank 3	Broadleafed upland forest, cismontane woodland, north coast coniferous forest/rocky, mesic. Elevation ranges from 100 to 3610 feet. Blooms Jun-Oct.	**No Potential.** The Project Area lacks the vegetation communities associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
serpentine daisy *Erigeron serpentinus*	Rank 1B.3	Chaparral (serpentine, seeps). Elevation ranges from 200 to 2200 feet. Blooms May-Aug.	**No Potential.** The Project Area lacks serpentine seeps associated with this species.	No further recommendations for this species.
slender cottongrass *Eriophorum gracile*	Rank 4.3	Bogs and fens, meadows and seeps, upper montane coniferous forest/acidic. Elevation ranges from 4200 to 9510 feet Blooms May-Sep.	**No Potential.** The Project Area lacks acidic soils known to support this species (CDFW 2017), and is well below the documented elevation range.	No further recommendations for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/often serpentine. Elevation ranges from 10 to 1350 feet. Blooms Feb-Apr.	**Moderate Potential.** The Project Area contains potentially suitable grassland habitat underlain by clay soils that could support this species. This perennial bulbiferous species is likely may not be precluded by previous disturbance (e.g. mowing) within the Project Area.	A protocol-level rare plant survey is recommended within the blooming period of the species.
woolly-headed gilia *Gilia capitata* ssp. *tomentosa*	Rank 1B.1	Coastal bluff scrub, valley and foothill grassland/serpentine, rocky, outcrops. Elevation ranges from 30 to 720 feet. Blooms May-Jul.	**No Potential.** The Project Area lacks serpentine soils and rocky outcrops associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Boggs Lake hedge-hyssop *Gratiola heterosepala*	SE, Rank 1B.2	Marshes and swamps (lake margins), vernal pools/clay. Elevation ranges from 30 to 7790 feet. Blooms Apr-Aug.	**No Potential.** The Project Area lacks large intact marshes and swamps, or vernal pools associated with this species.	No further recommendations for this species.
congested-headed hayfield tarplant *Hemizonia congesta* ssp. *congesta*	Rank 1B.2	Valley and foothill grassland/sometimes roadsides. Elevation ranges from 70 to 1840 feet. Blooms Apr-Nov.	**Moderate Potential.** The Project Area contains potentially suitable grassland habitat that may support this species. This species is relatively disturbance-tolerant and may not be precluded by previous and ongoing disturbance in the Project Area.	A protocol-level rare plant survey is recommended within the blooming period of the species.
hogwallow starfish *Hesperevax caulescens*	Rank 4.2	Valley and foothill grassland (mesic, clay), vernal pools (shallow)/sometimes alkaline. Elevation ranges from 0 to 1660 feet. Blooms Mar-Jun.	**No Potential.** The Project Area lacks vernal pools associated with this species. This species was included in the CNPS inventory database as a checklist for the Healdsburg quadrangle. However, this species is not documented in Sonoma or Marin counties (CCH 2017, Jepson eFlora 2017, CNPS 2016b, Best et. al. 1996, Howell et. al. 2007).	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
thin-lobed horkelia *Horkelia tenuiloba*	Rank 1B.2	Broadleafed upland forest, chaparral, valley and foothill grassland/mesic openings, sandy. Elevation ranges from 160 to 1640 feet. Blooms May-Jul (Aug).	**Unlikely.** The Project Area lacks sandy soils associated with this species.	No further recommendations for this species.
harlequin lotus *Hosackia gracilis*	Rank 4.2	Broadleafed upland forest, coastal bluff scrub, closed-cone coniferous forest, cismontane woodland, coastal prairie, coastal scrub, meadows and seeps, marshes and swamps, north coast coniferous forest, valley and foothill grassland/wetlands, roadsides. Elevation ranges from 0 to 2300 feet. Blooms Mar-Jul.	**Moderate Potential.** The Project Area contains potentially suitable seasonal wetland habitat that could support this species. This perennial fabaceous forb is relatively disturbance tolerant and may not be precluded by the disturbance regime (i.e. mowing) within the Project Area.	A protocol-level rare plant survey is recommended within the blooming period of the species.
coast iris *Iris longipetala*	Rank 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps/mesic. Elevation ranges from 0 to 1970 feet. Blooms Mar-May.	**Unlikely.** Despite potentially suitable grassland habitat, this species is more closely associated with coastal environments.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Burke's goldfields *Lasthenia burkei*	FE, SE, Rank 1B.1	Meadows and seeps (mesic), vernal pools. Elevation ranges from 50 to 1970 feet. Blooms Apr-Jun.	**Unlikely.** The Project area lacks vernal pools associated with this species. Seasonal wetlands within the Project Area are relatively disturbed and dominated by non-native annual grasses which likely outcompete many native annual forb species. The Project Area is located in area assessed by the Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007) as "no listed plants in the area".	No further recommendations for this species.
Baker's goldfields *Lasthenia californica* ssp. *bakeri*	Rank 1B.2	Closed-cone coniferous forest (openings), coastal scrub, meadows and seeps, marshes and swamps. Elevation ranges from 200 to 1710 feet. Blooms Apr-Oct.	**No Potential.** There is only one documented occurrence of this species in the vicinity of the Project Area from 1899 (CDFW 2016b). The majority of documented occurrences in Sonoma County are closer to the coast, and centered around the Bodega Bay area.	No further recommendations for this species.
Contra Costa goldfields *Lasthenia conjugens*	FE, Rank 1B.1	Cismontane woodland, playas (alkaline), valley and foothill grassland, vernal pools/mesic. Elevation ranges from 0 to 1540 feet Blooms Mar-Jun.	**No Potential.** The Project Area lacks vernal pools and alkaline substrates associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Colusa layia *Layia septrionalis*	Rank 1B.2	Chaparral, cismontane woodland, valley and foothill grassland/sandy, serpentine. Elevation ranges from 330 to 3590 feet. Blooms Apr-May.	**No Potential.** The Project Area lacks sandy serpentine soils associated with this species.	No further recommendations for this species.
legenere *Legenere limosa*	Rank 1B.1	Vernal pools. Elevation ranges from 0 to 2890 feet. Blooms Apr-Jun.	**No Potential.** The Project Area lacks vernal pools associated with this species.	No further recommendations for this species.
bristly leptosiphon *Leptosiphon acicularis*	Rank 4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland. Elevation ranges from 180 to 4920 feet. Blooms Apr-Jul.	**Unlikely.** The Project Area lacks shallow rocky soils and sparsely vegetated areas known to support this species.	No further recommendations for this species.
Jepson's leptosiphon *Leptosiphon jepsonii*	Rank 1B.2	Chaparral, cismontane woodland/usually volcanic. Elevation ranges from 330 to 1640 feet (100 to 500 meters). Blooms Mar-May.	**No Potential.** The Project Area lacks the vegetation communities and volcanic soils associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
woolly-headed Lessingia *Lessingia hololeuca*	Rank 3	Broadleafed upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland/clay, serpentine. Elevation ranges from 50 to 1000 feet. Blooms Jun-Oct.	**No Potential.** The Project Area lacks serpentine soils known to support this species.	No further recommendations for this species.
Pitkin Marsh lily *Lilium pardalinum* ssp. *pitkinense*	FE, SE, Rank 1B.1	Cismontane woodland, meadows and seeps, marshes and swamps (freshwater)/mesic, sandy. Elevation ranges from 110 to 210 feet. Blooms Jun-Jul.	**No Potential.** The Project Area lacks large intact marsh habitat and sandy soils associated with this species.	No further recommendations for this species.
redwood lily *Lilium rubescens*	Rank 4.2	Broadleafed upland forest, chaparral, lower montane coniferous forest, north coast coniferous forest, upper montane coniferous forest/sometimes serpentine, sometimes roadsides. Elevation ranges from 100 to 6270 feet. Blooms Apr-Aug (Sep).	**No Potential.** The Project Area lacks the vegetation communities associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Sebastopol meadowfoam *Limnanthes vinculans*	FE, SE, Rank 1B.1	Meadows and seeps, valley and foothill grassland, vernal pools/vernally mesic. Elevation ranges from 50 to 1000 feet. Blooms Apr-May.	**Unlikely.** The Project Area lacks vernal pools associated with this species. Seasonal wetlands within the Project Area are relatively disturbed and dominated by non-native annual grasses which likely outcompete many native annual forb species. The Project Area is located in area assessed by the Santa Rosa Plain Programmatic Biological Opinion (USFWS 2007) as "no listed plants in the area".	No further recommendations for this species.
Napa Lomatium *Lomatium repostum*	Rank 4.3	Chaparral, cismontane woodland/serpentine. Elevation ranges from 300 to 2720 feet. Blooms Mar-Jun.	**No Potential.** The Project Area lacks the vegetation communities and serpentine substrate known to support this species.	No further recommendations for this species.
Cobb Mountain lupine *Lupinus sericatus*	Rank 1B.2	Broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest. Elevation ranges from 900 to 5000 feet. Blooms Mar-Jun.	**No Potential.** The Project Area lacks the associated vegetation communities and is well below the documented elevation range of the species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Mt. Diablo cottonweed *Micropus amphibolus*	Rank 3.2	Broadleafed upland forest, chaparral, cismontane woodland, valley and foothill grassland/rocky. Elevation ranges from 150 to 2710 feet. Blooms Mar-May.	**Unlikely.** The Project Area lacks rocky substrates known to support this species.	No further recommendations for this species.
marsh microseris *Microseris paludosa*	Rank 1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland. Elevation ranges from 20 to 1160 feet (5 to 355 meters). Blooms Apr-Jun (Jul).	**Moderate Potential.** The Project Area contains potentially suitable grassland habitat that could support this species. This perennial species may not be precluded by previous disturbance (i.e. mowing) within the Project Area.	A protocol-level rare plant survey is recommended within the blooming period of the species.
green monardella *Monardella viridis*	Rank 4.3	Broadleafed upland forest, chaparral, cismontane woodland. Elevation ranges from 330 to 3310 feet. Blooms Jun-Sep.	**No Potential.** The Project Area lacks the vegetation communities associated with this species.	No further recommendations for this species.
cotula navarretia *Navarretia cotulifolia*	Rank 4.2	Chaparral, cismontane woodland, valley and foothill grassland/adobe. Elevation ranges from 10 to 6000 feet. Blooms May-Jun.	**Unlikely.** Despite potentially suitable grassland habitat and clay soils, the disturbance regime within the Project Area and dense thatch accumulation from non-native annual grasses likely precludes this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	Rank 1B.1	Cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools/mesic. Elevation ranges from 20 to 5710 feet. Blooms Apr-Jul.	**No Potential.** The Project Area lacks vernal pools and alkaline soils associated with this species (CDFW 2016).	No further recommendations for this species.
many-flowered navarretia *Navarretia leucocephala* ssp. *plieantha*	FE, SE, Rank 1B.2	Vernal pools (volcanic ash flow). Elevation ranges from 100 to 3120 feet (30 to 950 meters). Blooms May-Jun.	**No Potential.** The Project Area lacks vernal pools and volcanic ash flow substrates associated with this species.	No further recommendations for this species.
Sonoma beardtongue *Penstemon newberryi* var. *sonomensis*	Rank 1B.3	Chaparral (rocky). Elevation ranges from 2300 to 4490 feet. Blooms Apr-Aug.	**No Potential.** The Project Area lacks chaparral and is well below the documented elevation range of this species	No further recommendations for this species.
Gairdner's yampah *Perideridia gairdneri* ssp. *gairdneri*	Rank 4.2	Broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools/vernally mesic. Elevation ranges from 0 to 2000 feet (0 to 610 meters). Blooms Jun-Oct.	**Moderate Potential.** The Project Area contains vernally mesic grassland habitat that could support this species. This perennial species may not be precluded by previous (i.e. mowing) within the Project Area.	A protocol-level rare plant survey is recommended within the blooming period of the species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Calistoga popcornflower *Plagiobothrys strictus*	FE, ST, Rank 1B.1	Meadows and seeps, valley and foothill grassland, vernal pools/alkaline areas near thermal springs. Elevation ranges from 300 to 520 feet. Blooms Mar-Jun.	**No Potential.** This species is known from only two extant occurrences near Calistoga, where it is associated with hot springs (CNPS 2016b)	No further recommendations for this species.
North Coast semaphore grass *Pleuropogon hooverianus*	ST, Rank 1B.1	Broadleafed upland forest, meadows and seeps, north coast coniferous forest/open areas, mesic. Elevation ranges from 30 to 2200 feet. Blooms Apr-Jun.	**Unlikely.** The Project Area lacks forested habitats known to support this species.	No further recommendations for this species.
nodding semaphore grass *Pleuropogon refractus*	Rank 4.2	Lower montane coniferous forest, meadows and seeps, north coast coniferous forest, riparian forest/mesic. Elevation ranges from 0 to 5250 feet. Blooms (Mar), Apr-Aug.	**Unlikely.** The Project Area lacks forested habitats known to support this species.	No further recommendations for this species.
Cunningham Marsh cinquefoil *Potentilla uliginosa*	Rank 1A	Marshes and swamps/freshwater, permanent oligotrophic wetlands. Elevation ranges from 100 to 130. Blooms May-Aug.	**No Potential.** The Project Area lacks permanent oligotrophic wetlands. This species is presumed extinct.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
California alkali grass *Puccinellia simplex*	Rank 1B.2	Chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools/alkaline, vernally mesic; sinks, flats, and lake margins. Elevation ranges from 10 to 3050 feet (2 to 930 meters). Blooms Mar-May.	**No Potential.** The Project Area lacks alkaline substrates associated with this species.	No further recommendations for this species.
Lobb's aquatic buttercup *Ranunculus lobbii*	Rank 4.2	Cismontane woodland, north coast coniferous forest, valley and foothill grassland, vernal pools/mesic. Elevation ranges from 50 to 1540 feet. Blooms Feb-May.	**Unlikely.** The Project Area lacks large seasonally ponded areas with standing water depths of 6 inches or greater necessary to support this species.	No further recommendations for this species.
white beaked-rush *Rhynchospora alba*	Rank 2B.2	Bogs and fens, meadows and seeps, marshes and swamps (freshwater). Elevation ranges from 200 to 6690 feet. Blooms Jul-Aug.	**Unlikely.** The Project Area lacks large intact bogs, marshes and swamps associated with this species.	No further recommendations for this species.
California beaked-rush *Rhynchospora californica*	Rank 1B.1	Bogs and fens, lower montane coniferous forest, meadows and seeps (seeps), marshes and swamps (freshwater). Elevation ranges from 150 to 3310 feet. Blooms May-Jul.	**Unlikely.** The Project Area lacks large intact bogs, marshes and swamps associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
brownish beaked-rush *Rhynchospora capitellata*	Rank 2B.2	Lower montane coniferous forest, meadows and seeps, marshes and swamps, upper montane coniferous forest/mesic. Elevation ranges from 150 to 6560 feet. Blooms Jul-Aug.	**Unlikely.** The Project Area lacks large intact bogs, marshes and swamps associated with this species.	No further recommendations for this species.
round-headed beaked-rush *Rhynchospora globularis*	Rank 2B.1	Marshes and swamps (freshwater). Elevation ranges from 150 to 200 feet. Blooms Jul-Aug.	**Unlikely.** The Project Area lacks large intact bogs, marshes and swamps associated with this species.	No further recommendations for this species.
Napa checkerbloom *Sidalcea hickmanii* ssp. *napensis*	Rank 1B.1	Chaparral/rhyolitic. Elevation ranges from 1360 to 2000 feet. Blooms Apr-Jun.	**No Potential.** The Project area lacks chaparral and rhyolitic substrates known to support this species.	No further recommendations for this species.
Kenwood Marsh checkerbloom *Sidalcea oregana* ssp. *valida*	FE, SE, Rank 1B.1	Marshes and swamps (freshwater). Elevation ranges from 380 to 490 feet. Blooms Jun-Sep.	**Unlikely.** The Project Area lacks large intact marshes and swamps associated with this species.	No further recommendations for this species.
two-fork clover *Trifolium amoenum*	FE, Rank 1B.1	Coastal bluff scrub, valley and foothill grassland (sometimes serpentine). Elevation ranges from 20 to 1360 feet. Blooms Apr-Jun.	**Unlikely.** Despite potentially suitable grassland habitat present within the Project Area, grasslands within the Project Area are relatively disturbed. This species is only known from one natural extant occurrence in Marin County (CNPS 2016b, USFWS 2012).	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS***
Plants				
Santa Cruz clover *Trifolium buckwestiorum*	Rank 1B.1	Broadleafed upland forest, cismontane woodland, coastal prairie/gravelly, margins. Elevation ranges from 340 to 2000 feet. Blooms Apr-Oct.	**No Potential.** The Project Area lacks gravelly substrates known to support this species.	No further recommendations for this species.
saline clover *Trifolium hydrophilum*	Rank 1B.2	Marshes and swamps, valley and foothill grassland (mesic, alkaline), vernal pools. Elevation ranges from 0 to 980 feet. Blooms Apr-Jun.	**No Potential.** The Project Area lacks alkaline marshes and swamps known to support this species.	No further recommendations for this species.
coastal triquetrella *Triquetrella californica*	Rank 1B.2	Coastal bluff scrub, coastal scrub/soil. Elevation ranges from 30 to 330 feet.	**No Potential.** The Project Area lacks coastal scrub habitats.	No further recommendations for this species.
oval-leaved viburnum *Viburnum ellipticum*	Rank 2B.3	Chaparral, cismontane woodland, lower montane coniferous forest. Elevation ranges from 600 to 4200 feet. Blooms May-June.	**No Potential.** The Project Area lacks the vegetation communities associated with this species.	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
Mammals				
fringed myotis *Myotis thysanodes*	WBWG: High Priority	Associated with a wide variety of habitats including mixed coniferous-deciduous forest and redwood/ sequoia groves. Roosts in caves, mines, buildings, and crevices. Separate day and night roosts may be used.	**Moderate Potential.** The Project Area contains an uninhabited building that could potentially provide a roosting structure for this species. In addition, there is a potential water source for this species within 0.25 mile of the Project Area.	See Section 5.4.3 for recommendations for this species.
long-legged myotis *Myotis volans*	WBWG: High Priority	Primarily found in coniferous forests, but also occurs seasonally in riparian and desert habitats. Large hollow trees, rock crevices and buildings are important day roosts. Other roosts include caves, mines and buildings.	**Moderate Potential.** The Project Area contains an uninhabited building that could potentially provide a roosting structure for this species. In addition, there is a potential water source for this species within 0.25 mile of the Project Area.	See Section 5.4.3 for recommended mitigation measures.
hoary bat *Lasiurus cinereus*	WBWG: High Priority	Prefers open forested habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths. Requires water.	**No Potential.** The Project Area does not provide typical forested roosting habitat and is too small for the foraging requirements for this species	No further recommendations for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
pallid bat *Antrozous pallidus*	SSC; WBWG: High Priority	Found in deserts, grasslands, shrublands, woodlands, and forests. Most common in open, forages along river channels. Roost sites include crevices in rocky outcrops and cliffs, caves, mines, trees and various human structures such as bridges, barns, and buildings (including occupied buildings). Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Moderate Potential.** The Project Area contains an uninhabited building that could potentially provide a roosting structure for this species. In addition, there is a potential water source for this species within 0.25 mile of the Project Area.	See Section 5.4.3 for recommended mitigation measures.
Townsend's big-eared bat *Corynorhinus townsendii*	SSC; WBWG: High Priority	Associated with a wide variety of habitats from deserts to mid-elevation mixed coniferous-deciduous forest. Females form maternity colonies in buildings, caves and mines and males roost singly or in small groups. Foraging occurs in open forest habitats where they glean moths from vegetation.	**Moderate Potential.** The Project Area contains an uninhabited building that could potentially provide a roosting structure for this species. In addition, there is a potential water source for this species within 0.25 mile of the Project Area.	See Section 5.4.3 for recommended mitigation measures
western red bat *Lasiurus blossevillii*	SSC	Highly migratory and typically solitary, roosting primarily in the foliage of trees or shrubs. Roosts are usually in broad-leaved trees including cottonwoods, sycamores, alders, and maples. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas.	**Unlikely.** The Project Area may provide temporary roost habitat, but does not contain tree species and types to support maternity roosts. Additionally, Project Area does not contain suitable water sources typically used by this species.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
Yuma myotis *Myotis yumanensis*	WBWG: Low-Medium Priority	Known for its ability to survive in urbanized environments. Also found in heavily forested settings. Day roosts in buildings, trees, mines, caves, bridges and rock crevices. Night roosts associated with man-made structures.	**Moderate Potential.** The Project Area contains an uninhabited building that could potentially provide a roosting structure for this species. In addition, there is a potential water source for this species within 0.25 mile of the Project Area.	See Section 5.4.3 for recommended mitigation measures
American badger *Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Requires friable soils and open, uncultivated ground. Preys on burrowing rodents.	**Unlikely.** The Project Area is surrounded by residential development on three sides, and is not contiguous with typical open grassland inhabited by this species for dens and foraging. No potential burrows were observed and this species is not documented in southeast Santa Rosa.	No further surveys or mitigation measures are recommended.
Birds				
ferruginous hawk *Buteo regalis*	BCC	Winter visitor to open habitats, including grasslands, sagebrush flats, scrub, and low foothills surrounding valleys. Preys on mammals. Does not breed in California.	**Unlikely.** The Project Area is outside of the breeding range of this species; however, this species may occasionally forage within the Project Area during the winter.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
golden eagle *Aquila chrysaetos*	CFP, BCC	Found in rolling foothills with open grasslands, scattered trees, and cliff-walled canyons.	**Unlikely.** This species may occasionally forage within the Project Area. Typical nesting trees are not present within the Project Area or vicinity.	No further surveys or mitigation measures are recommended.
white-tailed kite *Elanus leucurus*	CFP	Year-long resident of coastal and valley lowlands, including agricultural areas. Preys on small diurnal mammals and occasional birds, insects, reptiles, and amphibians.	**Unlikely.** This species may occasionally forage within the Project Area. However, habitat quality is greatly diminished as a result of surrounding residential development. Few trees within Project Area to support potential nesting.	No further surveys or mitigation measures are recommended.
American peregrine falcon *Falco peregrinus anatum*	FD, SD, CFP, BCC	Winters throughout Central Valley. Requires protected cliffs and ledges for cover. Feeds on a variety of birds, and some mammals, insects, and fish.	**Unlikely.** This species may occasionally forage within the Project Area, however the Project Area lacks nesting habitat for this species. No cliff, ledge, or high-rise buildings are present.	No further surveys or mitigation measures are recommended.
western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC, SE, BCC	Nests in riparian jungles of willow often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape. Species requires an average of 17 hectares per pair for foraging and nesting.	**No Potential.** The Project Area and vicinity do not contain forested or riparian habitat necessary for this species.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
burrowing owl *Athene cunicularia*	SSC, BCC	Frequents open grasslands and shrublands with perches and burrows. Preys upon insects, small mammals, reptiles, birds, and carrion. Nests and roosts in old burrows of small mammals.	**Unlikely.** This species may occasionally forage in the Project Area, but the Project Area lacks small mammal burrows essential for nesting and common in foraging habitat. This species is extremely rare in Sonoma County.	No further surveys or mitigation measures are recommended.
black swift *Cyseloides niger*	SSC, BCC	Nesting sites are associated with sheer cliffs and waterfalls, either near the coast or in the mountains. Does not winter in California.	**No Potential.** The Project Area and vicinity lack cliff or waterfall habitat for this species.	No further surveys or mitigation measures are recommended.
Vaux's swift *Chaetura vauxi*	SSC	Forages high in the air over most terrain and habitats but prefers rivers/lakes. Requires large hollow trees for nesting.	**Unlikely**. The Project Area lacks the aquatic habitat preferred by this species. No snags or trees with snags with suitable hollows typically used by this species are present within the Project Area.	No further surveys or mitigation measures are recommended.
Allen's hummingbird *Selasphorus sasin*	BCC	Found in a wide variety of habitats that provide nectar-producing flowers. A common migrant and uncommon summer resident of California.	**Moderate Potential**. The Project Area is primarily grassland with little foraging potential for this species; however adjacent residential development may provide foraging habitat. Trees present within the Project Area provide potential nesting habitat.	See Section 5.4.3 for recommended mitigation measures
olive-sided flycatcher *Contopus cooperi*	SSC, BCC	Most often found in montane conifer forests where tall trees overlook canyons, meadows, lakes or other open terrain.	**No Potential.** The Project Area does not contain sufficient forested or aquatic habitat necessary for this species.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
yellow warbler *Setophaga petechia*	SSC, BCC	Nests in riparian stands of willows, cottonwoods, aspens, sycamores, and alders. Also nests in montane shrubbery in open conifer forests.	**No Potential.** The Project Area does not contain forested or riparian habitat necessary for this species.	No further surveys or mitigation measures are recommended.
yellow-breasted chat *Icteria virens*	SSC	Breeds in riparian thickets and woodlands, particularly those dominated by willows and cottonwoods.	**No Potential.** The Project Area does not contain forested or riparian habitat necessary for this species.	No further surveys or mitigation measures are recommended.
grasshopper sparrow *Ammodramus savannarum*	SSC	Frequents dense tall, dry or well-drained grasslands, especially native grasslands with mixed grasses and forbs for foraging and nesting. Nests on ground at base of overhanging clumps of vegetation.	**Unlikely.** This species is not known to nest in the vicinity, and the Project Area does not provide well-drained grasslands typical of this species. This species is more common in the coastal hills and dry interior hills.	No further surveys or mitigation measures are recommended.
tricolored blackbird *Agelaius tricolor*	SSC, BCC	Usually nests over or near freshwater in dense cattails, tules, or thickets of willow, blackberry, wild rose or other tall herbs.	**No Potential.** No suitable nesting habitat is present to support nesting by the species. The perennial marsh is not of sufficient size to support a colony for nesting or foraging.	No further surveys or mitigation measures are recommended.
Lawrence's goldfinch *Carduelis lawrencei*	BCC	Inhabits oak woodlands, chaparral, pinyon-juniper associations, and weedy areas near water during the breeding season; highly erratic and localized in occurrence.	**Unlikely.** No suitable oak woodland is present to support nesting of the species within the Project Area. The species is also an extremely rare breeder in Sonoma County.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
bank swallow *Riparia riparia*	ST; SSC	Summer resident in riparian and other lowland habitats near rivers, lakes and the ocean in northern California. Nests colonially in excavated burrows on vertical cliffs and bank cuts (natural and manmade) with fine-textured soils. Historical nesting range in southern and central areas of California has been eliminated by habitat loss. Currently known to breed in Siskiyou, Shasta, and Lassen Cos., portions of the north coast, and along Sacramento River from Shasta Co. south to Yolo Co.	**No Potential.** The Project Area does not contain riparian or other aquatic habitat necessary for this species.	No further surveys or mitigation measures are recommended.
Nuttall's woodpecker *Picoides nuttalli*	BCC	Year-round resident in lowland woodlands throughout much of California west of the Sierra Nevada. Typical habitat is dominated by oaks; also occurs in riparian woodland. Nests in tree cavities.	**Present.** This species was observed on the December 21 site visit.	See Section 5.4.3 for recommended mitigation measures
Reptiles and Amphibians				
Pacific (western) pond turtle *Actinemys marmorata*	SSC	Occurs in perennial ponds, lakes, rivers and streams with suitable basking habitat (mud banks, mats of floating vegetation, partially submerged logs) and shelter.	**Unlikely.** The Project Area does not contain aquatic habitat such as deep ponds or creeks with pools of sufficient depth to support the species. The perennial wetland does not have open water habitat and cannot support this species. No aquatic habitat is present within 300 feet of the Project Area.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
California giant salamander *Dicamptodon ensatus*	SSC	Occurs in the north-central Coast Ranges. Moist coniferous and mixed forests are typical habitat; also uses woodland and chaparral. Adults are terrestrial and fossorial, breeding in cold, permanent or semi-permanent streams. Larvae usually remain aquatic for over a year.	**No Potential.** The Project Area does not contain forested or aquatic habitat necessary for this species.	No further surveys or mitigation measures are recommended.
California tiger salamander *Ambystoma californiense*	FE, ST	Inhabits annual grassland habitat and mammal burrows. Seasonal ponds and vernal pools crucial to breeding. Federal Endangered status limited to populations in Sonoma and Santa Barbara counties.	**Unlikely.** Multiple assessments over several years in this region of the Santa Rosa Plain have yielded no CTS (*see section 4.3.2*). The Project Area does not contain aquatic breeding habitat nor upland habitat. Additionally, the nearest CNDDB occurrence is over 2 miles away and dispersal is prevented by Highway 101.	No further surveys or mitigation measures are recommended.
red-bellied newt *Taricha rivularis*	SSC	Inhabits coastal redwood forests and occasionally other forest types. Adults remain in breeding stream drainages in the non-breeding season. Breeding habitats are often fast-moving streams. Stagnant water sources are often avoided.	**No Potential.** The Project Area does not contain forested or aquatic habitat for this species.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
California red-legged frog *Rana draytonii*	FT, SSC	Associated with quiet perennial to intermittent ponds, stream pools and wetlands. Prefers shorelines with extensive vegetation. Documented to disperse through upland habitats after rains.	**Unlikely.** No suitable aquatic breeding, dispersal, or upland habitat is present within the Project Area, and no aquatic habitat is present within 300 feet of the Project Area. The nearest documented occurrence is nearly 5 miles from the Project Area.	No further surveys or mitigation measures are recommended.
foothill yellow-legged frog *Rana boylii*	SSC	Found in or near rocky streams in a variety of habitats. Feed on both aquatic and terrestrial invertebrates.	**No Potential.** No stream habitat is present within the Project Area, and no occurrences have been documented within 5 miles of Project Area.	No further surveys or mitigation measures are recommended.
Fish				
Navarro roach *Lavinia symmetricus navarroensis*	SSC	Habitat generalists. Found in warm intermittent streams as well as cold, well-aerated streams.	**No Potential.** The Project Area does not contain streams, rivers or other perennial waters to support this species.	No further surveys or mitigation measures are recommended.
coho salmon - Central California Coast ESU *Oncorhynchus kisutch*	FE, SE	State listing is limited to Coho south of San Francisco Bay. The Federal listing is limited to naturally spawning populations in streams between Punta Gorda, Humboldt County and the San Lorenzo River, Santa Cruz County. Spawns in coastal streams at temperatures from 4-14C. Prefer beds of loose, silt-free, coarse gravel and cover nearby for adults.	**No Potential.** The Project Area does not contain streams, rivers or drainages to support this species.	No further surveys or mitigation measures are recommended.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE	RESULTS AND RECOMMENDATIONS
WILDLIFE				
steelhead - Central California Coast ESU *Oncorhynchus mykiss irideus*	FT	From Russian River south to Soquel Creek and Pajaro River. Also San Francisco and San Pablo Bay Basins.	**No Potential.** The Project Area does not contain streams, rivers drainages to support this species.	No further surveys or mitigation measures are recommended.
Russian River tule perch *Hysterocarpus traski pomo*	SSC	Found in clear, flowing freshwater with abundant vegetation and overhanging cover. Confined to the Russian River and tributaries.	**No Potential.** The Project Area does not contain streams, rivers or other perennial waters to support this species.	No further surveys or mitigation measures are recommended.
Invertebrates				
western bumblebee *Bombus occidentalis*	SSI	Occurs in a wide variety of habitat types. Nests are constructed annually in pre-existing cavities, usually on the ground (e.g. mammal burrows). Many plant species are visited and pollinated.	**Unlikely.** No small mammal burrows are present within the Project Area. This species may forage in the Project Area on occasion.	No further surveys or mitigation measures are recommended.
California freshwater shrimp *Syncaris pacifica*	FE, SE, SSI	Endemic to Marin, Napa, and Sonoma Counties. Found in shallow pools away from streamflow in low gradient streams where riparian cover is moderate to heavy.	**No Potential.** The Project Area does not contain streams, rivers or other perennial waters to support this species.	No further surveys or mitigation measures are recommended.

*** Key to status codes:**

FE	Federal Endangered
FT	Federal Threatened
SE	State Endangered
SD	State Delisted
ST	State Threatened
SR	State Rare
SSC	Species of Special Concern
SSI	Species of Special Interest
BCC	Bird of Conservation Concern

California Rare Plant Rank (CRPR)

Rank 1A	CRPR 1A: Plants presumed extinct in California
Rank 1B	CRPR 1B: Plants rare, threatened or endangered in California and elsewhere
Rank 2A	CRPR 2A: Plants presumed extirpated in California, but more common elsewhere
Rank 2B	CRPR 2B: Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3	CRPR 3: Plants about which CNPS needs more information (a review list)
Rank 4	CRPR 4: Plants of limited distribution (a watch list)
Threat Ranks	
0.1	Seriously threatened in California
0.2	Moderately threatened in California
0.3	Not very threatened in California

****Potential to Occur:**

No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

*****Results and Recommendations:**

Present. Species was observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

Assumed Present. Species has a high likelihood of occurring and actions to avoid/mitigate impacts are recommended; surveys not conducted.

Assumed Absent. Species is assumed to not be present or utilize the site due to a lack of key habitat components.

Not Observed. Species was not observed during protocol-level surveys.

APPENDIX C

SITE PHOTOGRAPHS

Photograph 1. Photograph depicting perennial wetland dominated by narrow-leaf cattail (*Tyhpa angustifolia*) within the Project Area.

Photograph taken December 21, 2016.

Photograph 2. Photograph depicting drainage patterns within the seasonal wetland feature. Dominated vegetation includes Italian ryegrass (*Festuca perennis*), and curly dock (*Rumex crispus*).

Photograph taken December 21, 2016.

Photograph 3. Photograph depicting non-native annual grassland in foreground, seasonal wetland in midground, and disturbed/developed area at left in background.

Photograph taken December 21, 2016.

Photograph 4. Photograph depicting one of the previously developed houses in the developed/disturbed portion of the Project Area.

Photograph taken December 21, 2016.

July 25, 2017

Nadin Sponamore
Sponamore Associates
Environmental Planning
2128 Contra Costa Avenue
Santa Rosa, California 95405

RE: Special-status Plant Survey, Penstemon Place Project, Santa Rosa, CA

Dear Ms. Sponamore,

This letter summarizes the findings of two special-status plant surveys conducted in March and July 2017 at the approximately 9.7-acre property located at 2842, 2862, and 2574 Linwood Avenue (APNs #044-200-027, -029, -040), in the southeast quadrant of the City of Santa Rosa, Sonoma County, California (Project Area). The following sections provide background, methods and results of the two surveys.

Background

On December 21, 2016, WRA conducted a biological resources assessment (BRA) within the Project Area and determined that five special-status plants had high or moderate potential to occur within the Project Area:

- Fragrant fritillary (*Fritillaria liliacea*), CNPS Rank 1B
- Congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*), CNPS Rank 1B
- Harlequin lotus (*Hosackia gracilis*), CNPS Rank 4
- Marsh microseris (*Microseris paludosa*), CNPS Rank 1B
- Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*), CNPS Rank 4

Due to the timing of the BRA site visit, outside of the documented bloom period of the aforementioned species, WRA recommended that protocol-level rare plant surveys be conducted to determine presence or absence of the five special-status plant species determined to have high or moderate potential to occur within the Project Area[1].

To determine if the species were present within the Project Area, protocol-level special-status plant surveys were recommended during peak bloom of each species. The BRA had initially recommended that three surveys be conducted, in March, April, and July. However, it was later

[1] WRA, Inc. (WRA). 2017. Biological Resources Assessment, Penstemon Place Development Project, Santa Rosa, Sonoma County, California. March.

determined that each of these species have peak blooming periods in either March or July[2], and two surveys would be sufficient to cover the species with potential to occur.

Methods

Two protocol-level special status plant surveys were conducted on March 17 and July 10, 2017 to determine the presence or absence of special-status plant species. The March survey was to determine presence of fragrant fritillary and harlequin lotus, while the July survey was to determine presence of congested-headed hayfield tarplant, marsh microseris, and Gairdner's yampah. Reference sites for fragrant fritillary, harlequin lotus, and congested-headed hayfield tarplant were conducted prior to the surveys to confirm the timing of the surveys were sufficient to identify these species. The surveys corresponded to blooming periods sufficient to observe and identify all special-status plant species determined to have high or moderate potential to occur in the Project Area. WRA botanists familiar with the flora of Sonoma and surrounding counties conducted the field surveys. The surveys followed the protocol for plant surveys described by resource agency guidelines[345]. Plants were identified using *The Jepson Manual, 2nd Edition*[6] and Jepson eFlora[7], to the taxonomic level necessary to determine whether or not they were rare. Plant names follow the most current nomenclature, Jepson eFlora. The plant surveys were floristic in nature with all observed species recorded and included as a species list provided in Attachment A.

Results

The March survey resulted in negative findings for special-status plant species. The Project Area is mowed annually in early May for fire control purposes. Therefore, the late-season survey was scheduled in early July so as the late season blooming plants had time to sprout and bloom after the annual mowing. Both marsh microseris and Gairdner's yampah are perennial species and are able to sprout from perennial rootstock, even after disturbance such as mowing. Additionally, congested-headed hayfield tarplant is an annual species with a life cycle that begins in late spring or early summer, which would indicate that spring mowing would not adversely affect the species ability to sprout and bloom. The early May mowing of the Project Area did not inhibit determining the presence or absence of each of these species. The July survey resulted in negative findings for special special-status plant species.

Should you have any questions or concerns, please feel free to contact me.

Sincerely,

[2] California Native Plant Society (CNPS). 2017. Electronic Inventory of Rare and Endangered Vascular Plants of California. California Native Plant Society, Sacramento, CA. Available at: http://www.cnps.org/inventory.
[3] California Native Plant Society (CNPS). 2001. Botanical Survey Guidelines. June 2.
[4] California Department of Fish and Game. 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. November 24.
[5] U.S. Fish and Wildlife Service (USFWS). 1996. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants. September 23.
[6] Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (eds.). 2012. The Jepson Manual: Vascular Plants of California, 2nd edition. University of California Press, Berkeley, CA.
[7] Jepson Flora Project (eds.). 2017. Jepson eFlora. Online at: http://ucjeps.berkeley.edu/IJM.html.

Doug Spicher
Principal
spicher@wra-ca.com
WRA, Inc.
2169-G East Francisco Blvd.
San Rafael, California 94901

ATTACHMENTS

Attachment A: List of Observed Plant Species within the Project Area

Attachment A. Plant Species Observed in the Study Area on December 21, 2016, March 17, and July 10 2017.

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Agavaceae	*Chlorogalum pomeridianum*	Amole	-	-
Anacardiaceae	*Toxicodendron diversilobum*	Poison oak	-	-
Apiaceae	*Foeniculum vulgare*	Fennel	-	High
Apiaceae	*Perideridia kelloggii*	Yampah	-	-
Apiaceae	*Scandix pecten-veneris*	Shepherd's needle	-	-
Apiaceae	*Torilis arvensis*	Field hedge parsley	-	Moderate
Apocynaceae	*Asclepias fascicularis*	Milkweed	-	-
Apocynaceae	*Nerium oleander*	Oleander	-	-
Araliaceae	*Hedera helix*	English ivy	-	-
Arecaceae	*Syagrus romanzoffiana*	Queen palm	-	-
Arecaceae	*Washingtonia robusta*	Washington fan palm	-	Moderate
Asteraceae	*Anthemis cotula*	Dog fennel	-	-
Asteraceae	*Baccharis pilularis*	Coyote brush	-	-
Asteraceae	*Calendula arvensis*	Field marigold	-	-

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Asteraceae	*Filago pyramidata* var. *pyramidata*	Herba impia	-	-
Asteraceae	*Helminthotheca echioides*	Bristly ox-tongue	-	Limited
Asteraceae	*Hemizonia congesta* ssp. *lutescens*	Hayfield tarweed	-	-
Asteraceae	*Hypochaeris radicata*	Hairy cats ear	-	Moderate
Asteraceae	*Lactuca serriola*	Prickly lettuce	-	-
Asteraceae	*Logfia filaginoides*	California cottonrose	-	-
Asteraceae	*Senecio vulgaris*	Common groundsel	-	-
Asteraceae	*Sonchus oleraceus*	Sow thistle	-	-
Asteraceae	*Tragopogon* sp.	-	-	-
Asteraceae	*Wyethia angustifolia*	Narrow leaved mule ears	-	-
Boraginaceae	*Plagiobothrys* sp.	-	-	-
Brassicaceae	*Brassica rapa*	Common mustard	-	Limited
Brassicaceae	*Hirschfeldia incana*	Mustard	-	Moderate
Brassicaceae	*Lepidium latifolium*	Perennial pepperweed	-	High

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Brassicaceae	*Lepidium nitidum*	Shining pepper grass	-	-
Brassicaceae	*Raphanus sativus*	Jointed charlock	-	Limited
Cactaceae	*Opuntia ficus-indica*	Tuna	-	-
Caryophyllaceae	*Cerastium glomeratum*	Large mouse ears	-	-
Convolvulaceae	*Convolvulus arvensis*	Field bindweed	-	-
Crassulaceae	*Crassula connata*	Sand pygmy weed	-	-
Cupressaceae	*Juniperus* sp.	-	-	-
Cyperaceae	*Cyperus eragrostis*	Tall cyperus	-	-
Dipsacaceae	*Dipsacus fullonum*	Wild teasel	-	Moderate
Fabaceae	*Acmispon americanus* var. *americanus*	Spanish lotus	-	-
Fabaceae	*Medicago polymorpha*	California burclover	-	Limited
Fabaceae	*Trifolium glomeratum*	Clustered clover	-	-
Fabaceae	*Trifolium hirtum*	Rose clover	-	Limited
Fabaceae	*Trifolium microdon*	Valparaiso clover	-	-

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Fabaceae	*Trifolium pratense*	Red clover	-	-
Fabaceae	*Trifolium subterraneum*	Subterranean clover	-	-
Fabaceae	*Vicia sativa*	Spring vetch	-	-
Fagaceae	*Quercus agrifolia*	Coast live oak	-	-
Fagaceae	*Quercus lobata*	Valley oak	-	-
Gentianaceae	*Zeltnera muehlenbergii*	Muehlenberg's centaury	-	-
Geraniaceae	*Erodium botrys*	Big heron bill	-	-
Geraniaceae	*Erodium cicutarium*	Coastal heron's bill	-	Limited
Geraniaceae	*Erodium moschatum*	Whitestem filaree	-	-
Geraniaceae	*Geranium dissectum*	Wild geranium	-	Limited
Iridaceae	*Sisyrinchium californicum*	California golden eyed grass	-	-
Juglandaceae	*Juglans hindsii*	Northern California black walnut	Rank 1B.1*	-
Juncaceae	*Juncus bufonius*	Common toad rush	-	-
Juncaceae	*Juncus patens*	Rush	-	-

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Juncaceae	*Juncus xiphioides*	Iris leaved rush	-	-
Lamiaceae	*Melissa officinalis*	Lemon balm	-	-
Lamiaceae	*Mentha pulegium*	Pennyroyal	-	Moderate
Laxmanniaceae	*Cordyline australis*	Cabbage tree	-	Limited
Montiaceae	*Claytonia perfoliata*	Miner's lettuce	-	-
Moraceae	*Morus alba*	Mulberry	-	-
Onagraceae	*Epilobium brachycarpum*	Willow herb	-	-
Orobanchaceae	*Parentucellia viscosa*	Yellow parentucellia	-	Limited
Papaveraceae	*Eschscholzia californica*	California poppy	-	-
Plantaginaceae	*Kickxia elatine*	Sharp point fluellin	-	-
Plantaginaceae	*Plantago lanceolata*	Ribwort	-	Limited
Platanaceae	*Platanus ×hispanica*	-	-	-
Poaceae	*Avena barbata*	Slim oat	-	Moderate
Poaceae	*Briza minor*	Little rattlesnake grass	-	-

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Poaceae	*Bromus diandrus*	Ripgut brome	-	Moderate
Poaceae	*Bromus hordeaceus*	Soft chess	-	Limited
Poaceae	*Festuca bromoides*	Brome fescue	-	-
Poaceae	*Festuca perennis*	Italian rye grass	-	-
Poaceae	*Hordeum brachyantherum*	Meadow barley	-	-
Poaceae	*Hordeum murinum*	Foxtail barley	-	Moderate
Poaceae	*Paspalum dilatatum*	Dallis grass	-	-
Poaceae	*Phalaris aquatica*	Harding grass	-	Moderate
Poaceae	*Phalaris paradoxa*	Hood canarygrass	-	-
Poaceae	*Poa annua*	Annual blue grass	-	-
Poaceae	*Stipa pulchra*	Purple needle grass	-	-
Polygonaceae	*Rumex pulcher*	Fiddleleaf dock	-	-
Ranunculaceae	*Ranunculus californicus*	Common buttercup	-	-
Ranunculaceae	*Ranunculus muricatus*	Buttercup	-	-

Family	Scientific Name	Common Name	Rarity Status[1]	CAL-IPC Status[2]
Rosaceae	*Prunus cerasifera*	Cherry plum	-	Limited
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	-	High
Rubiaceae	*Galium aparine*	Cleavers	-	-
Salicaceae	*Salix lasiolepis*	Arroyo willow	-	-
Themidaceae	*Dichelostemma capitatum*	Blue dicks	-	-
Themidaceae	*Triteleia laxa*	Ithuriel's spear	-	-
Typhaceae	*Typha latifolia*	Broadleaf cattail	-	-

* CNPS rarity status only applies to native occurrences which are not found in the Project Area (CNPS 2016b). This species has been widely planted throughout California.

All species identified using the *Jepson Manual II: Vascular Plants of California* (Baldwin et al. 2012) and *Jepson eFlora* (Jepson Flora Project [eds.] 2017); Nomenclature follows *Jepson eFlora*.

[1]Rare Status: The CNPS Inventory of Rare and Endangered Plants (CNPS 2016b)

FE:	Federal Endangered
FT:	Federal Threatened
SE:	State Endangered
ST:	State Threatened
SR:	State Rare
Rank 1A:	Plants presumed extirpated in California and either rare or extinct elsewhere
Rank 1B:	Plants rare, threatened, or endangered in California and elsewhere
Rank 2A:	Plants presumed extirpated in California, but more common elsewhere
Rank 2B:	Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3:	Plants about which we need more information – a review list
Rank 4:	Plants of limited distribution – a watch list

[2]Invasive Status: California Invasive Plant Inventory (Cal-IPC 2016)

High: Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate: Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited-moderate distribution ecologically
Limited: Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Assessed: Assessed by Cal-IPC and determined to not be an existing current threat

June 6, 2017

Nadin Sponamore
Sponamore Associates
Environmental Planning
2128 Contra Costa Avenue
Santa Rosa, California 95405

RE: Special-status Plant Survey Status Update
Penstemon Place Project, Santa Rosa, CA

Dear Nadin:

WRA, Inc. has been assessing the probability that certain special-status plants may be present or absent at the Penstemon Place Project site in Santa Rosa, CA. We have been in process of conducting surveys for plants that have a moderate or higher potential to be present based on site conditions and reported occurrences in the area. These include the following:

fragrant fritillary (*Fritillaria lilliacea*)
harlequin lotus (*Hosackia gracilis*)
congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*)
Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*)

A protocol survey for fragrant fritillary and harlequin lotus was conducted on March 10, 2017, which was within the typical blooming period for both of these plants, and none were observed. Therefore, these two plants are now considered to not be present. The two remaining plants, because of their later typical blooming period, require a survey in late July or August. While we anticipate that neither of these two species are present, the survey is needed to conclusively confirm presence or absence. With confirmation that neither species is present, the project would have no adverse impacts to special-status plant species. If one or both species should happen to be confirmed present, then potential impacts to these species could be avoided or reduced to less than significance by the following:

- Avoid the area where plants are present, if practicable.
- If impacts are unavoidable, collect seed (congested-headed hayfield tarplant, an annual) or remove and transplant (Gairdner's yampah, a perennial) and transfer to a suitable location.

There are no mitigation banks for mitigating unavoidable impacts to these species.

We will track the blooming activity of these two later blooming plants so that the survey can be conducted as soon as possible, however, at this time, we expect that the survey will be in late July or August and we will inform you once conclusive results are available.

If you have questions or require additional information, please contact us.

Sincerely,

Douglas Spicher
Principal

ATTACHMENT D-2

DRAFT
JURISDICTIONAL WETLANDS DELINEATION REPORT

McIntosh Property

WRA Environmental Consultants
April, 2015

Jurisdictional Wetlands Delineation Report
McIntosh Property

DRAFT

SONOMA COUNTY, CALIFORNIA

Prepared For:

Aaron Matz

Contact:
Douglas Spicher
spicher@wra-ca.com

Date:
April 2015

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1.0 INTRODUCTION

1.1 Study Background

This report presents the results of a delineation of Waters of the U.S. ("waters") under Section 404 of the Clean Water Act at 2842 Linwood Avenue, Santa Rosa, California (Study Area) (Figure 1). The property is composed of three parcels (APN: 044-200-027, 044-200-029, 044-200-040), and is bounded by other private property on the east, residential development to the north, Linwood Avenue and residential development to the west and to the south. The delineation was performed on April 20, 2015 by WRA, Inc.

1.2 Regulatory Background

1.2.1 Clean Water Act Section 404

Section 404 of the Clean Water Act (CWA) gives the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) regulatory and permitting authority regarding discharge of dredged or fill material into "navigable waters of the United States". Section 502(7) of the Clean Water Act defines navigable waters as "waters of the United States, including territorial seas." Section 328 of Chapter 33 in the Code of Federal Regulations defines the term "waters of the United States" as it applies to the jurisdictional limits of the authority of the Corps under the Clean Water Act. A summary of this definition of "waters of the U.S." in 33 CFR 328.3 includes (1) waters used for commerce; (2) interstate waters and wetlands; (3) "other waters" such as intrastate lakes, rivers, streams, and wetlands; (4) impoundments of waters; (5) tributaries to the above waters; (6) territorial seas; and (7) wetlands adjacent to waters. Therefore, for purposes of the determining Corps jurisdiction under the Clean Water Act, "navigable waters" as defined in the Clean Water Act are the same as "waters of the U.S." defined in the Code of Federal Regulations above.

The limits of Corps jurisdiction under Section 404 as given in 33 CFR Section 328.4 are as follows: (a) *Territorial seas:* three nautical miles in a seaward direction from the baseline; (b) *Tidal waters of the U.S.:* high tide line or to the limit of adjacent non-tidal waters; (c) *Non-tidal waters of the U.S.:* ordinary high water mark or to the limit of adjacent wetlands; (d) *Wetlands:* to the limit of the wetland. A discussion of the methodology used to delineate wetlands and waters is presented in Section 3.1.

2.0 SUMMARY OF POTENTIAL JURISDICTIONAL AREAS

Areas determined to be jurisdictional under Section 404 of the CWA were delineated based on field surveys conducted by WRA on April 20, 2015. The results of the delineation are summarized below.

2.1 Waters of the U.S.

Figure 2 depicts the extent of Corps jurisdiction within the Study Area based on the wetland delineation mentioned above. The acreage and length of potential jurisdictional areas are summarized in Table 1. The Study Area contains approximately 1.46 acres meeting the criteria of wetlands. All wetlands delineated within the Study Area are considered to be potential jurisdictional features under the CWA Section 404.

Table 1. Summary of Potential CWA Section 404 Jurisdictional Areas.

Wetland Habitat Type	Area (acres)	Potential Jurisdictional Waters of the U.S. (acres)
Seasonal Wetland	1.41	1.41
Perennial Wetland	0.05	0.05
TOTAL	**1.46**	**1.46**

3.0 METHODS

Prior to conducting field surveys, reference materials were reviewed, including the *Soil Survey of Sonoma County* (USDA 1977), the California Soil Resource Lab (CSRL 2014), the Santa Rosa USGS 7.5-minute quadrangle (USGS 1954), and National Wetland Inventory (NWI) data (USFWS 2014), as well as historical and contemporary aerial photographs and personal accounts from people with knowledge of the site. Following the background data search, WRA biologists performed a focused evaluation of indicators of wetlands at the Study Area on March 20 and April 30, 2014.

The methods used in this study to delineate jurisdictional wetlands and non-wetland waters are based on the *U.S. Army Corps of Engineers Wetlands Delineation Manual* ("Corps Manual"; Environmental Laboratory 1987, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* ("Arid West Supplement"; Corps 2008), and the *Ordinary High Water Mark Identification* (Corps 2005). The routine method for wetland delineation described in the Corps Manual was used to identify areas potentially subject to Corps Section 404 jurisdiction within the Study Area.

A general description of the Study Area, including the on-site vegetation communities, topography, and land use was based on observations made during the site visit. The methods for evaluating the presence of wetlands and non-wetland waters employed during the delineation are described in detail below.

3.1 Wetlands

The Study Area was evaluated for the presence or absence of indicators of the three wetland parameters described in the Corps Manual (Environmental Laboratory 1987) and the Arid West Supplement (Corps 2008).

Section 328.3 of the Federal Code of Regulations defines wetlands as:

> *"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."*
>
> EPA, 40 CFR 230.3 and CE, 33 CFR 328.3 (b)

The three parameters used to delineate wetlands are the presence of: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. According to the Corps Manual, for areas not considered “problem areas” or “atypical situations”:

> *"....[E]vidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination."*

Data on vegetation, hydrology, and soils collected at sample points during the delineation site visit were reported on Arid West Supplement data forms. Once an area was determined to be a potential jurisdictional wetland, its boundaries were delineated using GPS equipment and mapped on a topographic map. The areas of potential jurisdictional wetlands were measured digitally using ArcGIS software. Indicators described in the Arid West Supplement were used to make wetland determinations at each sample point in the Study Area and are summarized below.

Vegetation

Plant species identified on the Study Area were assigned a wetland status according to the U.S. Fish and Wildlife Service list of plant species that occur in wetlands (Lichvar 2012). This wetland classification system is based on the expected frequency of occurrence in wetlands as follows:

OBL:	Obligate species	Always found in wetlands	>99% frequency
FACW:	Facultative Wetland species	Usually found in wetlands	67-99%
FAC:	Facultative species	Equally found in wetlands & non-wetlands	34-66%
FACU:	Facultative Upland species	Usually found in non-wetlands	1-33%
UPL/NL:	Upland/Not Listed species	Always found in uplands	<1%

The presence of hydrophytic vegetation was then determined based on indicator tests described in the Arid West Supplement. The Arid West Supplement requires that a three-step process be conducted to determine if hydrophytic vegetation is present. The procedure first requires the delineator to apply the “50/20 rule” (Indicator 1; Dominance Test) described in the manual. To apply the “50/20 rule”, dominant species are chosen independently from each stratum of the community. Dominant species are determined for each vegetation stratum from a sampling plot of an appropriate size surrounding the sample point. Dominants are the most abundant species that individually or collectively account for more than 50 percent of the total vegetative cover in the stratum, plus any other species that, by itself, accounts for at least 20 percent of the total vegetative cover. If greater than 50 percent of the dominant species has an OBL, FACW, or FAC status the sample point meets the hydrophytic vegetation criterion.

If the sample point fails Indicator 1 and both hydric soils and wetland hydrology are not present, then the sample point does not meet the hydrophytic vegetation criterion, unless the site is a problematic wetland situation. However, if the sample point fails Indicator 1 but hydric soils and wetland hydrology are both present, the delineator must apply Indicator 2.

Indicator 2 is known as the Prevalence Index (PI). The prevalence index is a weighted average of the wetland indicator status for all plant species within the sampling plot. Each indicator

status is given a numeric code (OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5). Indicator 2 requires the delineator to estimate the percent cover of each species in every stratum of the community and sum the cover estimates for any species that is present in more than one stratum. The delineator must then organize all species into groups according to their wetland indicator status and calculate the Prevalence Index using the following formula, where A equals total percent cover:

$$PI = \frac{A_{OBL} + 2A_{FACW} + 3A_{FAC} + 4A_{FACU} + 5A_{UPL}}{A_{OBL} + A_{FACW} + A_{FAC} + A_{FACU} + A_{UPL}}$$

The Prevalence Index will yield a number between 1 and 5. If the Prevalence Index is equal to or less than 3, the sample point meets the hydrophytic vegetation criterion.

Soils

The Natural Resource Conservation Service (NRCS) defines a hydric soil as follows:

> *"A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part."*
>
> Federal Register July 13, 1994,
> U.S. Department of Agriculture, NRCS

Soils formed over long periods of time under wetland (anaerobic) conditions often possess characteristics that indicate they meet the definition of hydric soils. Hydric soils can have a hydrogen sulfide (rotten egg) odor, low chroma matrix color, generally designated 0, 1, or 2, used to identify them as hydric, presence of redox concentrations, gleyed or depleted matrix, or high organic matter content.

Specific indicators that can be used to determine whether a soil is hydric for the purposes of wetland delineation are provided in the NRCS *Field Indicators of Hydric Soils in the U.S.* (USDA 2010). The Arid West Supplement provides a list of 23 of these hydric soil indicators which are known to occur in the Arid West region. Soil samples were collected and described according to the methodology provided in the Arid West Supplement. Soil chroma and values were determined by utilizing a standard Munsell soil color chart (GretagMacbeth 2000).

Hydric soils were determined to be present if any of the soil samples met one or more of the 23 hydric soil indicators described in the Arid West Supplement.

Hydrology

The Corps jurisdictional wetland hydrology criterion is satisfied if an area is inundated or saturated for a period sufficient to create anoxic soil conditions during the growing season (a minimum of 14 consecutive days in the Arid West region). Evidence of wetland hydrology can include primary indicators, such as visible inundation or saturation, drift deposits, oxidized root channels, and salt crusts, or secondary indicators such as the FAC-neutral test, presence of a

shallow aquitard, or crayfish burrows. The Arid West Supplement contains 16 primary hydrology indicators and 10 secondary hydrology indicators. Only one primary indicator is required to meet the wetland hydrology criterion; however, if secondary indicators are used, at least two secondary indicators must be present to conclude that an area has wetland hydrology.

The presence or absence of the primary or secondary indicators described in the Arid West Supplement was utilized to determine if sample points within the Study Area met the wetland hydrology criterion.

Wetland Classification

Several wetland classification systems and aquatic resource inventories are currently in use in California, such as the NWI (Cowardin et al. 1979, USFWS 2014), and Bay Area Aquatic Resources Inventory (BAARI; SFEI 2014). However, the scope of these inventories typically requires in-field classifications based on site hydrology (e.g. duration, volume, velocity), micro-topography, landscape position, soil type, and/or dominant vegetation community (e.g. perennial, annual). For instance, California hosts several types of vernal pools (i.e. hardpan, clay-rich, volcanic ash flow), with differing soil types and hydroperiods resulting in very different vegetative and faunal communities.

3.2 Non-wetland Waters

This study also evaluated the presence of "waters of the U.S." other than wetlands potentially subject to U.S. Army Corps of Engineers jurisdiction under Section 404 of the Clean Water Act, referred to herein as non-wetland waters. Other areas, besides wetlands, subject to Corps jurisdiction include lakes, rivers and streams (including intermittent streams) in addition to all areas below the HTL in areas subject to tidal influence. Jurisdiction in non-tidal areas extends to the ordinary high water mark (OHWM) defined as:

> "...that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impresses on the bank, shelving, changes in the characteristics of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."
>
> Federal Register Vol. 51, No. 219,
> Part 328.3 (e). November 13, 1986

Identification of the ordinary high water mark followed the Corps Regulatory Guidance Letter No. 05-05, *Ordinary High Water Mark Identification* (Corps 2005).

4.0 SITE DESCRIPTION

4.1 Location and Site History

The approximately 10-acre Study Area is located in Santa Rosa, California (Figure1). The Study Area is within the Santa Rosa USGS 7.5-minute quadrangle (USGS 1954) and is situated

within a landscape with residential neighborhoods on the north, west, and south, and low density residences to the east. The Study Area is not within the Santa Rosa Plain geographic area and lies at elevations ranging between approximately 235 feet to 275 feet above sea level. The site is open, non-native annual grassland with a few coast live oak trees (*Quercus agrifolia*).

Past land use was probably for grazing, and today the site is mostly vacant except for several existing residences along the western and southern boundaries that face Linwood Avenue and a well located nearly in the center of the property. Most areas of the site appears relatively undisturbed but past disturbances include the southwestern corner and along the existing residences and there is a developed well with pressure tanks, etc., near the center of the site. There is also an east-west roadway crossing the center portion of the property consisting of two linear concrete wheel tracks spaced apart at a width that would accommodate driving a vehicle from Linwood Avenue to the east. Historic aerial photographs show that the roadway ascended and ended on the hill east of the property and was used, perhaps as an all-weather access, to some buildings that may have been a residence.

The site is mowed annually for fire reduction purposes.

4.2 Vegetation

The Study Area's Mediterranean climate contributes to the existing vegetation structure and species assemblages. The main vegetation community is non-native annual grassland consisting of a mix of non-native grasses and forbs, such as soft chess (*Bromus hordeaceous*), wild oat (*Avena barbata*), and some less frequent native species, such as mule ears (*Wyethia angustifolia*) and purple needle grass (*Stipa pulchra*). Within the grassland landscape there are a few coast live oak trees, patches of Himalayan blackberry (*Rubus armeniacus*), one area of perennial wetland, and areas that have indicators of seasonal wetland.

4.3 Soils

The *Soil Survey of Sonoma County* (USDA 1977, CSRL 2014) indicates that the Study Area has one native soil mapping unit: Raynor clay, 2 to 9 percent slopes. Generally, observed soils within the Study Area were native with no areas of imported soil with the possible exception of some areas immediately adjacent to the residential homes surrounding the property.

<u>Raynor Series</u>. The Raynor Series consists of well drained clays formed over volcanic and andesitic rocks and lie at elevations ranging from 200 to 1,200 feet above sea level (CSRL 2014, USDA 1977). Land uses generally consist of pastureland, and annual grasses and forbs with scattered oaks comprise the native or naturalized vegetation (USDA 1977).

A representative pedon of Wright loam consists of an A-horizon of slightly acid, black clay (10YR 2/1), when moist, and approximately 1.5 feet deep. Structure is granular in the upper half and prismatic below. Raynor soils would have the potential to support episaturated soil that can support wetlands conditions, particularly in swale, lowland, or depression microtopography due the thickness of the clay layer.

4.4 Hydrology

The Study Area is entirely within the Upper Laguna de Santa Rosa watershed (HUC12: 180101100701), which is within the greater Russian River watershed (HUC8: 18010110). No

mapped blue-line streams are present within the Study Area. Topography of the Study Area indicates runoff moves toward the northwest corner where there is a storm drain inlet consisting of twin 12-inch culverts (one concrete and one corrugated metal). Following the storm drain system to determine where outfall may occur into a stream or other watercourse was not within the scope of this delineation, however it is assumed that runoff eventually flows to a navigable waters of the U.S., likely the Laguna de Santa Rosa which is tributary to the Russian River.

The undeveloped portions of the Study Area do not contain modifications to the hydrology of the site. However, runoff leaves the property at a single point at the northwest corner and flows along a concrete lined bed and concrete block retaining wall where it is directed into a storm drain consisting of two 12-inch culverts. Flow from the southern half of the property to the northern half also is directed through a single culvert under the concrete wheel track roadway.

Precipitation falls as rainfall with an annual average of 30.74 inches for Santa Rosa, Sonoma County (WRCC 2014). Fog is common in the Study Area with low-lying, fall and winter convection fog, and drifting spring and summer advection fog. A WETS analysis was conducted for Santa Rosa (CIMIS #83, National Weather Service) for the three month period prior the site visit (Appendix A). As of April 27, 2015, there have been 21.9 inches of precipitation since the water year began in October 2014, representing 75 percent of the average amount of rain for the water year thus far. However, the three month (February – April) antecedent conditions prior to the site visit was considered Below Normal and was only 37 pecent of the amount that would be considered normal or average for that time period (Appendix A). In addition to the amount of rain that is received in a given year, the pattern of rainfall received also affects conditions related to wetlands functions. For the October 2014-April 2015 period, although 75 percent of the normal amount of rainfall was received, nearly half (45 percent) was received within a one week period in December; other rainfall events were separated by long period of warm, dry weather, an extremely abnormal pattern.

5.0 RESULTS

Areas within the Study Area that are potentially jurisdictional under Section 404 of the Clean Water Act are summarized in Table 1 and shown in Figure 2. Rainfall data and WETS analysis for Santa Rosa (Station # 7965), California is included in Appendix A. Standard Corps Arid West wetland delineation data forms are included in Appendix B. Photographs of representative portions of the Study Area are provided in Appendix C. A list of all plant species observed during the site visits is included in Appendix D.

5.1 Potential Section 404 Waters of the U.S.

5.1.1 Wetlands

The Study Area wetlands total approximately 1.46 acres as illustrated in Figure 2. Two wetland types were classified and mapped in the Study Area: seasonal wetland (1.41 acres) and perennial wetland (0.05 acre). The boundary between wetland and upland communities varied depending upon wetland specific conditions; however, generally, distinct changes in vegetation, topographic shifts, and soil redoximorphic features were the dominant delineation indicators. WRA conducted the delineation during a single visit on April 20, 2015 which was during a continuing drought period and with only 37 percent of the normal amount of rainfall received in

the three months prior to the site visit. These conditions invoked using the procedures for delineating wetlands in a drought cycle according to the Arid West Supplement.

Sampling of vegetation, soils, and hydrology was conducted at numerous sample locations; however, due to the similarity between sampling locations, each sample location was not documented with a data form (Appendix B). All wetlands mapped and presented in this report are likely to be considered jurisdictional by the Corps as they are directly connected to a "relatively permanent water" assumed to occur through subsurface flow in municipal storm drain system with an eventual connection to a "navigable waters of the U.S." (Laguna de Santa Rosa, Russian River).

Upland areas. The majority of the Study Area is composed of areas mapped as upland. Universally, these areas lacked indicators of wetland hydrology and/or redoximorphic soil indicators, though at times some plants with wetland classification, such as Italian ryegrass (*Festuca perennis*) were present. The dominant vegetation type was non-native annual grasses dominated by a range of species including wild oat (*Avena barbata*, NL), soft chess (*Bromus hordeaceus*, FACU), ripgut brome (*B. diandrus*, NL), Italian rye grass (FAC), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*, FAC), and mouse barley (*H. murinum*, FACU). Upland areas were generally delineated from wetlands based on the prevalence or dominance of soft chess and other upland classified plants, along with absence of soil redoximorphic features, topography and/or lack of hydrology indicators. Additional upland areas include developed or partially developed portions of the Study Area, namely the existing residential homes.

Perennial Wetland (PEM2C). Perennial wetlands usually have surface water or saturated soil near the surface from a high water table that is present year round or for most of the year. These conditions are tolerated only plants with OBL or FACW classifications, such as cattail (*Typha* spp.) or rushes (*Juncus* spp.). The vegetation observed in the perennial wetland observed on the property included narrow leaved cattail (*Typha angustifolia*, OBL), iris-leaf juncus (*Juncus xiphioides*, OBL), pennyroyal (*Menthe pulegium*, OBL) and soils were either saturated or minor surface inundation. This wetland was located downslope of a hillside slump located to the northeast and may be the discharge point of an underground seep. The area surrounding the perennial wetland had low chroma soils with redoximorphic features and a prevalence of wetland classified plants that included Italian ryegrass and Mediterranean barley, both FAC, and also some FACU species, such as Rancheria clover (*Trifolium albopurpureum*).

Seasonal Wetland. Seasonal wetlands probably are the result of heavy clay soil through which water moves slowly and creates wetlands characteristics, including a prevalence of wetland classified plants, hydric soils, and wetland hydrology. These seasonal wetlands are on generally sloping topography with some areas that are level with subtle depressions or are blocked (e.g., by the concrete wheel tracks) where water inundates the surface and creates wetland hydrology surface indicators, such as algal mat formation.

Seasonal wetlands had wetland classified plants ranging from OBL, including iris-leaf rush and pennyroyal, to FACW, such as nutsedge (*Cyperus eragrostis*), meadow barley (*Hordeum branchyantherum*), and spiny buttercup (*Ranunculus muricatus*), to FAC, such as Italian ryegrass and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*).

Seasonal wetlands are situated on clay soils that were consistent with the mapped soil type (USDA 1980). Soils were typically very dark (10YR 3/2) to black 10YR 3/1 with distinct to

prominent redoximorphic mottles of strong brown (7.5YR 3/4) to dark reddish brown (5YR 3/4), meeting (F6) Redox Dark Surface conditions (Corps 2008, USDA 2010).

The wetland hydrology in the seasonal hillslope wetlands is partly episaturated with the source from direct precipitation and under- and over-land sheet flow and partly from groundwater from upslope sources. Saturation is likely to be present throughout the majority of the wet season and into the growing season in normal and above normal rainfall years, while inundation would likely be short-lived and shallow as water moves downslope. Observed wetland hydrology indicators varied across the site, but generally included (B12) biotic crust, (B10) drainage patterns, and (C3) oxidized rhizospheres along living roots. Boundaries of seasonal hillslope wetland and upland were mapped primarily based on subtle to distinct changes in topography and soil redoximorphic features and change in vegetation composition.

5.1.2 Non-wetland Waters

No areas within the Study Area meet the definition of Section 404 non-wetland waters.

6.0 POTENTIAL JURISDICTIONAL AREAS

The conclusions of this report are based on conditions observed at the time of the field delineation conducted on April 20, 2015. Based on the findings of the wetland delineation, the Study Area contains approximately 1.46 acres of areas considered potential jurisdictional wetlands. The two wetland types delineated within the Study Area included seasonal wetland (1.41 acres) and perennial wetland (0.05 acre). Wetlands were distinguished by the presence of five percent or greater cover of hydrophytes, hydric soils, and wetland hydrology indicators, and are connected to navigable waters (Laguna de Santa Rosa, Russian River); and therefore, meet the definition of “Waters of the U.S.” under Section 404 of the Clean Water Act.

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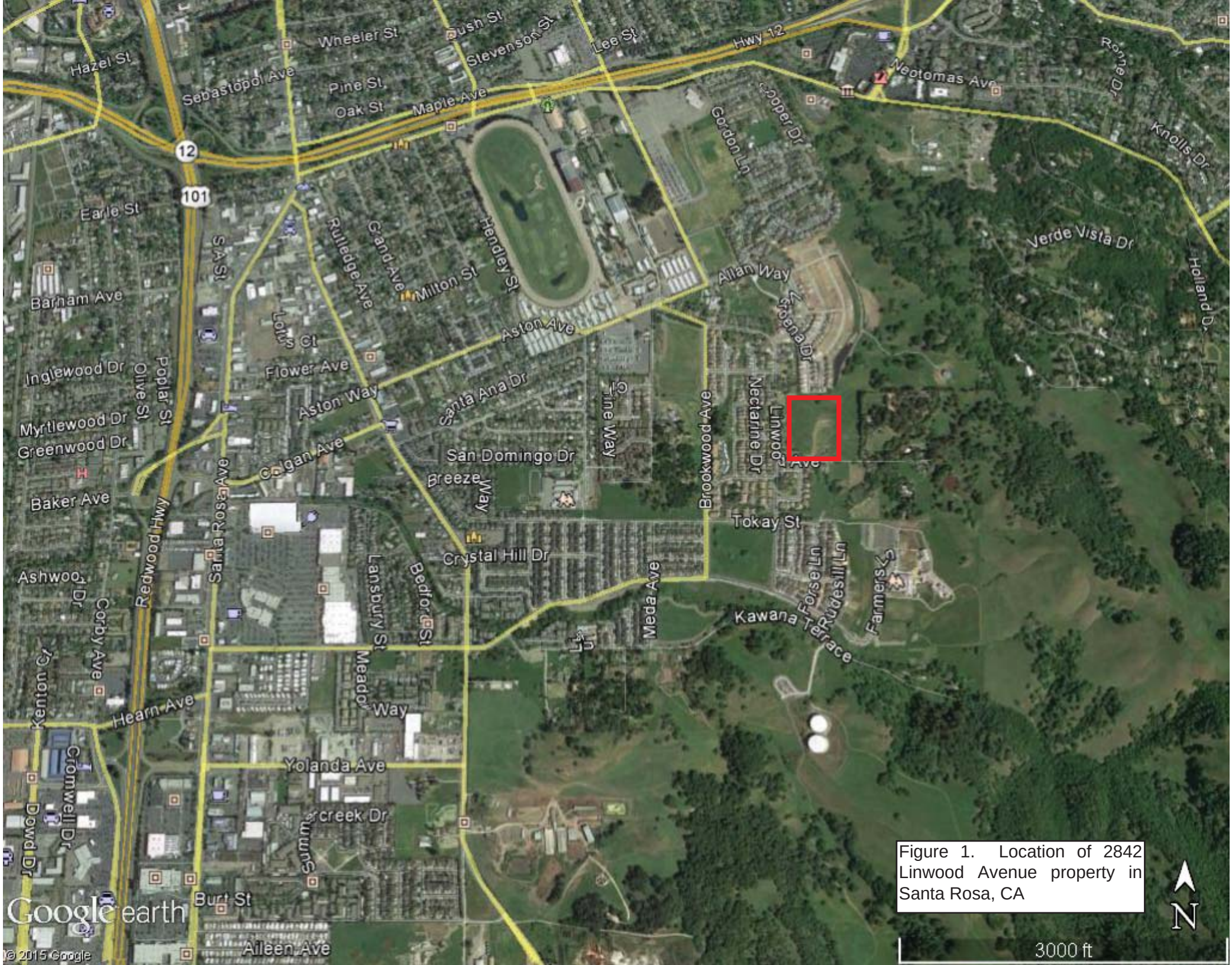

Figure 1. Location of 2842 Linwood Avenue property in Santa Rosa, CA

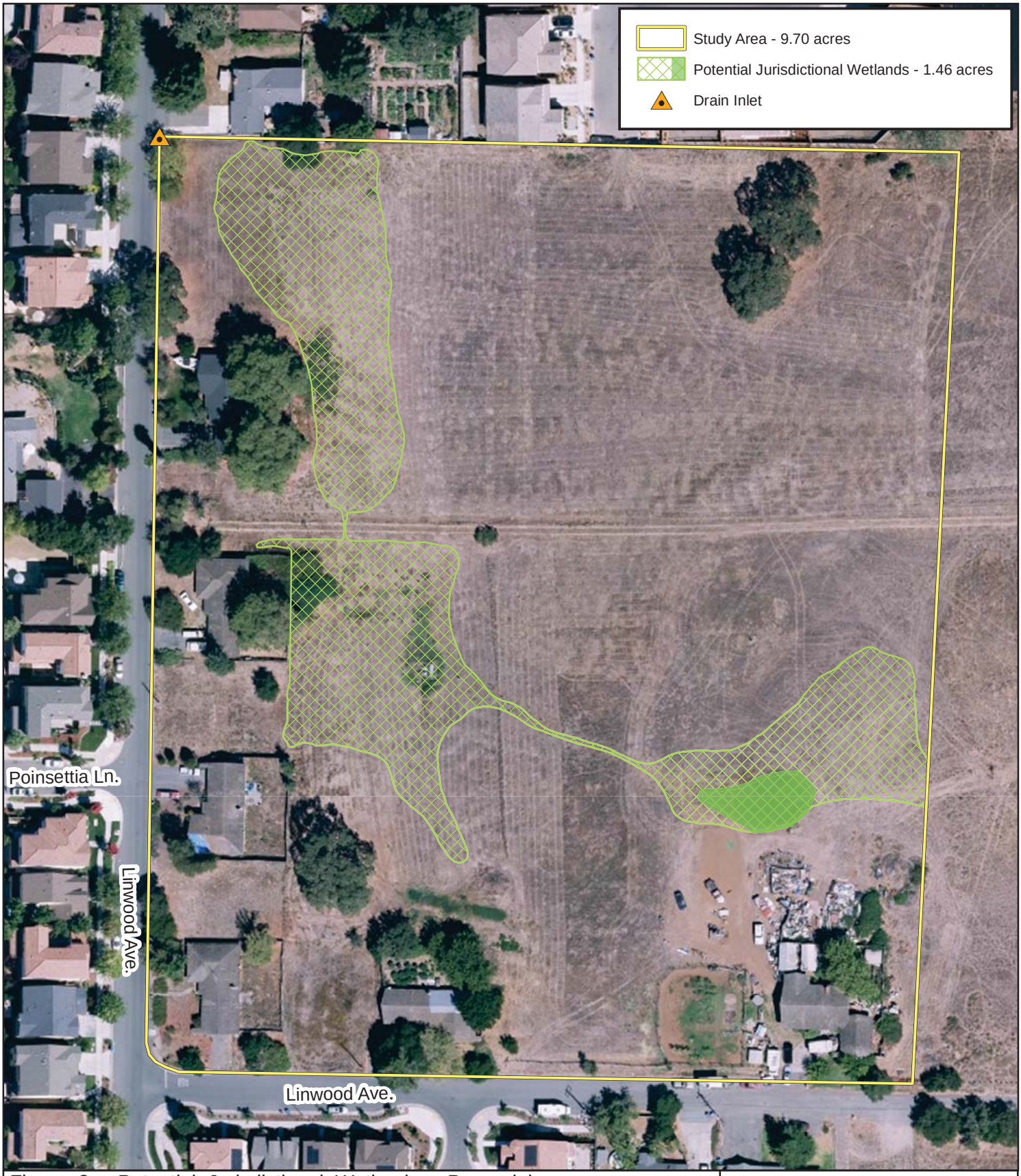

Figure 2. Potential Jurisdictional Wetlands. Perennial wetland (solid green) is included in the total potential jurisdictional area and covers approximately 0.05 acre.

N
W E
S

0 50 100 200
Feet

McIntosh Property
Sonoma County, California

wra
ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 4/27/2015
Map Prepared By: dchan
Base Source: ESRI World Imagery (2010)
Data Source(s): WRA

Path: L:\Acad 2000 Files\25000\25096\GIS\ArcMap\Fig2_Delin_20150427.mxd

APPENDIX A – Rainfall Data and WETS Analysis for Santa Rosa, CA

Appendix A. WETS Tables for Santa Rosa, Sonoma County

In Water Year 2014-2015, the region experienced periods of rainfall considered within the normal or above normal amount range (blue cells below) and periods of below normal rainfall to very dry (pink cells below). The site visits conducted in late April 2015 followed a relatively dry period for the preceding months, and the normal amount received in April did little to break drought conditions or create areas of saturation or inundation that would likely occur in years with more normal rainfall received and pattern in which it was received.

Table E-1. WETS Table for Santa Rosa, Sonoma County (CIMIS #83)

Month	Precipitation (inches)				Percent Normal
	Below normal	Normal	Above normal	Observed Rainfall	
OCT 2014	0.83	1.81	2.28	0.76	42%
NOV 2014	1.44	4.27	5.11	3.37	79%
DEC 2014	2.22	4.49	5.56	13.01	290%
JAN 2015	2.99	6.13	7.49	0.15	2%
FEB 2015	2.67	5.97	7.28	2.89	48%
MAR 2015	1.97	4.74	5.77	0.22	5%
APR 2015*	0.78	1.62	1.98	1.50	93%
				--	--
				--	--
				--	--
				--	--
				--	--
TOTAL	**12.90**	**29.03**	**35.47**	**21.90**	**75%**

*- precipitation data from National Weather Service at Santa Rosa Airport from April 1-April 26, 2015.

Table E-2. WETS Analysis for February-April (CIMIS #83 and National Weather Service)

Month Prior	Month	Below Normal	Normal	Above Normal	Observed Rainfall	Condition	Condition Value	Weighted Factor	Product
3rd	FEB	2.99	6.13	7.49	2.89	BELOW	1	1	1
2nd	MAR	2.67	5.97	7.28	0.22	BELOW	1	2	2
1st	APR	1.97	4.74	5.77	1.50	NORMAL	2	3	6
								SUM:	**9****
								Condition:	**BELOW**

** - SUM: 6-9 = Below Normal
10-14 = Normal
15-18 = Above Normal

APPENDIX B – Arid West Wetland Delineation Data Forms & PJD Form

APPENDIX C – Representative Photographs of the Study Area

Appendix C. Representative Photographs

Top: Non-native annual grassland sloping from the south and east toward the point in the foreground. The gradual slope on heavy clay soil creates conditions for seasonal wetlands.

Bottom: Some areas where depressions occur had indicators of surface inundation.

Photographs taken March 29, 2015

wra ENVIRONMENTAL CONSULTANTS

Appendix C. Representative Photographs

Top: The concrete wheel track roadway blocks runoff between the south and north portions of the property. A culvert under the roadway does allow water to flow through.

Bottom: Runoff leaves the property at the northwestern corner on a concrete lined bottom and concrete block retaining wall adjacent to a residence. Water drains into twin 12-inch storm drain culverts.

Photographs taken March 29, 2015

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APPENDIX D – List of All Plant Species Observed within the Study Area

ATTACHMENT D-3

ARBORIST'S REPORT

Tree Inventory & Evaluation

Penstemon Place

Becky Duckles, ISA Certified Consulting Arborist

May 21, 2018

BECKY DUCKLES
CONSULTING ARBORIST & LANDSCAPE ADVISOR
SEBASTOPOL, CA 707.829.0555 PH

Penstemon Place
Santa Rosa, Ca

ARBORIST'S SUMMARY
May 21, 2018

This site contains a large pasture area and several older, modest ranch homes. Three very large, heritage valley oaks will be preserved, and others near Linwood Ave. will be preserved if possible, though if they lose too many roots during excavation for the adjoining road section, the monitoring arborist may declare them unsafe to retain and they will be removed. The landscape architects and engineers have adjusted their plans to preserve these trees and others where possible, given site constraints.

I have reviewed the Tentative Map for the project dated May 2018 by Carlile Macy, and discussed grading and site development with the landscape architect. We will continue to try to arrive at solutions to minimize impact on the oaks near Linwood Ave. during construction of street improvements. A consulting arborist will be present during work done within their driplines to assess how many roots are encountered that must be cut. A note stating this will be printed on construction plans to alert the contractors and supervisors to schedule the arborist. If the trees are deemed by the arborist to be unstable or hazardous after that work they will be removed and mitigated.

The enclosed Tree Inventory shows all trees potentially impacted by construction, with common and botanical names, diameters at breast height (4'-6" unless noted otherwise), and condition and structure ratings. Comments are given regarding whether trees are to be removed or preserved, and whether they are protected or not by Santa Rosa's tree ordinance. Sheet L-1 of the Preliminary Landscape Master Plan and the Tentative Map show existing tree numbers as they relate to the tree inventory and spreadsheet, as they are tagged on site. Tree protection fencing will be installed at the outer edge of the protected tree driplines prior to construction, or at the limit of required access on Linwood. Project landscape architects are providing a list of trees to be removed with mitigation calculations. Locations, species and sizes of mitigation trees are shown on project landscape plans.

Please contact me if clarification or further information is needed.

Respectfully submitted,

Becky Duckles
Becky Duckles, Project Arborist
ISA Certified Consulting Arborist #WE-0796A

PENSTEMON PLACE
Santa Rosa, Ca

TREE PROTECTION NOTES

1. Plastic or chain link tree protection fencing shall be installed at the driplines of trees to remain (or the outer edge of the dripline of groups of trees). If it must be removed during construction for access, it shall be replaced immediately after work is completed.

2. Pruning should be the minimum necessary for hazard reduction or necessary access (i.e. the removal of deadwood 2" and larger, etc.), clearance, and crown restoration. It should be done by trained, qualified tree workers according to ISA Pruning Guidelines, prior to construction activity and fencing.

3. Where trenching, excavation, or other construction must occur within the driplines of protected trees to remain, a monitoring arborist should be notified ahead of the work (24-48 hours) to be present during the work. If any roots larger than 1" are encountered that cannot be preserved, they should be cut cleanly across the face of the root with a sharp saw. If required removal of roots may destabilize existing trees near road improvements, monitoring arborist may request removal of trees to reduce hazard. If such removals occur, they will be documented, and mitigated as per ordinance.

4. Where drainage swales or utilities must pass within tree driplines, they should be hand dug or excavated under the supervision of an arborist. Roots 2”+ should be preserved where possible.

5. Wood chip mulch generated from pruning should be spread under protected trees to serve as a permanent top dressing and mulch. It should be augmented to provide a 4” layer of mulch within the driplines of all trees to remain within the limits of construction.

6. No parking, storage, or disposal of materials (such as concrete slurry, paint, etc.), or other construction activity shall occur within driplines of protected trees to remain.

PENSTEMON PLACE - SANTA ROSA

TREE #	SPECIES	TRUNK DIAMETER (In.)	GENERAL HEALTH/ CONDITION	STRUCTURAL INTEGRITY	CONSTRUCTION IMPACT/RECOMMENDATIONS
1	Valley Oak/*Quercus lobata*	34"	Good	Good	To be preserved; site plan has been developed to protect; heritage tree
2	Valley Oak/*Quercus lobata*	30"	Good/Excellent	Good	To be preserved; site plan has been developed to protect; heritage tree
3	Coast Live Oak/*Quercus agrifolia*	12,18"	Good/Excellent	Good	To be preserved; on adjacent property to north; 20' crown radius to south; details of retaining wall and adjacent construction have been refined to protect tree
4	Black Walnut/*Juglans nigra*	5,10,11"	Good	Good	To be removed for construction; protected tree
5	Black Walnut/*Juglans nigra*	6,7,7,8"	Fair	Fair	To be removed for construction; protected tree
6	Valley Oak/*Quercus lobata*	28"	Good/Excellent	Good/Excellent	Will attempt to preserve; may have to be removed; minimize depth of road section/paving; heritage tree
7	Coast Live Oak/*Quercus agrifolia*	6,7" @ 3'	Good/Excellent	Good	To be removed for construction; heritage tree
8	Valley Oak/*Quercus lobata*	5"	Good/Excellent	Good/Excellent	To be removed for construction; heritage tree
9	Black Acacia/*Acacia melanoxylon*	6+ multi	Fair	Fair	To be removed for construction; not a protected tree
10	Cherry/*Prunus* sp.	4"+ multi	Fair	Fair	To be removed for construction; not a protected tree
11	Valley Oak/*Quercus lobata*	9"	Excellent	Good	To be removed for construction; heritage tree
12	Apple/*Malus* sp.	3,4,6,7"	Good	Fair/Good	To be removed for construction; not a protected tree
13	Mexican Fan Palm/*Washingtonia robusta*	17"	Good	Fair/Good	To be removed for construction; protected tree
14	Valley Oak/*Quercus lobata*	12"	Good	Good	To be removed for construction; heritage tree
15	London Plane/*Platanus x acerifolia*	25"	Excellent	Excellent	To be removed for construction; protected tree
16	London Plane/*Platanus x acerifolia*	30"	Excellent	Excellent	To be removed for construction; protected tree
17	Coast Live Oak/*Quercus agrifolia*	17"	Excellent	Good/Excellent	To be removed for construction; heritage tree
18	Coast Live Oak/*Quercus agrifolia*	7"	Good	Good	To be removed for construction; heritage tree
19	Coast Live Oak/*Quercus agrifolia*	13"	Good	growing horizontally	To be removed for construction; heritage tree
20	Coast Live Oak/*Quercus agrifolia*	5"	Good/Excellent	Fair; poor form	To be removed for construction; protected tree
21	London Plane/*Platanus x acerifolia*	24"	Good/Excellent	Good/Excellent	To be removed for construction; protected tree
22	Valley Oak/*Quercus lobata*	4,4,5,6,6,7"	Good	Fair; multi-trunk	To be removed for construction; heritage tree
23	Coast Live Oak/*Quercus agrifolia*	15" @ 2'	Excellent	Good	To be removed for construction; heritage tree
24	Valley Oak/*Quercus lobata*	7"	Excellent	Good/Excellent	To be removed for construction; heritage tree
25	Valley Oak/*Quercus lobata*	6"	Excellent	Excellent	To be removed for construction; protected tree
26	Valley Oak/*Quercus lobata*	39"	Good/Excellent		To be preserved; low-branched on south & east; may need clearance pruning; heritage tree
27	Hackberry/*Celtis* sp.	5"	Good/Excellent	Good	To be removed for construction; protected tree
28	Black Acacia/*Acacia melanoxylon*	14"	Good	Fair	To be removed for construction; not a protected tree
29	Black Acacia/*Acacia melanoxylon*	7,8"	Good	Fair	To be removed for construction; not a protected tree
30	Valley Oak/*Quercus lobata*	13"	Good	Good/Excellent	May be removed; minimize depth of road section/paving; monitor grading; heritage tree
31	Coast Live Oak/*Quercus agrifolia*	7,11"	Good/Excellent	Good	May be removed; minimize depth of road section/paving; will need clearance pruning; heritage tree
32	Silver Maple/*Acer saccharinum*	35"	Poor	Poor; fallen, decaye	Fallen, decayed; not viable, not protected species; to be removed

PENSTEMON PLACE - SANTA ROSA

TREE #	SPECIES	TRUNK DIAMETER (In.)	GENERAL HEALTH/ CONDITION	STRUCTURAL INTEGRITY	CONSTRUCTION IMPACT/RECOMMENDATIONS
33	Coast Live Oak/*Quercus agrifolia*	10,14"	Excellent	Good	To be removed for construction; heritage tree
34	Coast Live Oak/*Quercus agrifolia*	12"	Excellent	Fair	To be removed for construction; heritage tree
35	Valley Oak/*Quercus lobata*	7"	Good/Excellent	Good	To be removed for construction; heritage tree
36	Coast Live Oak/*Quercus agrifolia*	6"	Good/Excellent	Good	To be removed for construction; heritage tree
37	Valley Oak/*Quercus lobata*	12"	Good	Good	To be removed for construction; heritage tree
38	Valley Oak/*Quercus lobata*	9"	Good/Excellent	Good/Excellent	To be removed for construction; heritage tree
39	Valley Oak/*Quercus lobata*	13"	Good/Excellent	Good/Excellent	To be removed for construction; heritage tree
40	Fruitless Mulberry/*Morus alba*	20" @ 3'	Good/Excellent	Fair	To be removed for construction; not a protected tree
41	Coast Live Oak/*Quercus agrifolia*	28" @ 3'	Good/Excellent	Good	May have to be removed; minimize depth of road section/paving; monitor grading; will need clearance pruning; heritage tree
42	Monterey Pine/*Pinus radiata*	20"	Good	Good	To be removed for construction; not a protected tree
43	Fruitless Mulberry/*Morus alba*	23"	Good	Fair	To be removed for construction; not a protected tree
44	Coast Live Oak/*Quercus agrifolia*	8,11"	Excellent	Good	To be removed for construction; heritage tree
45	Coast Live Oak/*Quercus agrifolia*	7"	Excellent	Good	To be removed for construction; heritage tree
46	Coast Live Oak/*Quercus agrifolia*	21"	Excellent	Good/Excellent	To be removed for construction; heritage tree
47	Coast Live Oak/*Quercus agrifolia*	10"	Excellent	Good	To be removed for construction; heritage tree
48	Valley Oak/*Quercus lobata*	4"	Good/Excellent	Good	To be removed for construction; protected tree
49	Fruitless Mulberry/*Morus alba*	18"	Good	Good	To be removed for construction; not a protected tree
50	Fruitless Mulberry/*Morus alba*	15"	Good	Fair	To be removed for construction; not a protected tree
51	Coast Live Oak/*Quercus agrifolia*	15"	Fair	Fair	To be removed for construction; heritage tree
52	Fruitless Mulberry/*Morus alba*	27"	Good	Fair	To be removed for construction; not a protected tree
53	Monterey Pine/*Pinus radiata*	7"	Good	Good	To be removed for construction; not a protected tree
54	Coast Live Oak/*Quercus agrifolia*	5,7,11"	Good/Excellent	Good	To be removed for construction; heritage tree

ATTACHMENT D-4

TREE MITIGATION TABULATION

Per City of Santa Rosa Ordinance

Penstemon Place

Carlile - Macy
May, 2018

CARLILE · MACY

TREE MITIGATION TABULATION

Per City of Santa Rosa Ordinance

PROJECT NAME: Penstemon Place
LOT NUMBERS: Lots 1 - 59
CM PROJECT #: 2015013.00 DATE: May 2018

~ Trees To Be Removed ~			Diameter Removed (inches)	Status
Tree #	DBH	Species		
1	34"	Valley Oak/Quercus lobata	0	**Preserved**
2	30"	Valley Oak/Quercus lobata	0	**Preserved**
3	12,18"	Coast Live Oak/Quercus agrifolia	NOT IN PROJECT	
4	5,10,11"	Black Walnut/Juglans nigra	26	Removed
5	6,7,7,8"	Black Walnut/Juglans nigra	28	Removed
6	28"	Valley Oak/Quercus lobata	28	**May be removed**
7	6,7" @ 3'	Coast Live Oak/Quercus agrifolia	13	Removed
8	5"	Valley Oak/Quercus lobata	5	Removed
9	6+ multi	Black Acacia/Acacia melanoxylon	EXEMPT	Removed
10	4"+ multi	Cherry/Prunus sp.	EXEMPT	Removed
11	9"	Valley Oak/Quercus lobata	9	Removed
12	3,4,6,7"	Apple/Malus sp.	EXEMPT	Removed
13	17"	Mexican Fan Palm/Washingtonia robusta	17	Removed
14	12"	Valley Oak/Quercus lobata	12	Removed
15	25"	London Plane/Platanus x acerifolia	25	Removed
16	30"	London Plane/Platanus x acerifolia	30	Removed
17	17"	Coast Live Oak/Quercus agrifolia	17	Removed
18	7"	Coast Live Oak/Quercus agrifolia	7	Removed
19	13"	Coast Live Oak/Quercus agrifolia	13	Removed

~ Trees To Be Removed ~			Diameter Removed (inches)	Status
Tree #	DBH	Species		
20	5"	Coast Live Oak/Quercus agrifolia	5	Removed
21	24"	London Plane/Platanus x acerifolia	24	Removed
22	4,4,5,6,6,7"	Valley Oak/Quercus lobata	32	Removed
23	15" @ 2'	Coast Live Oak/Quercus agrifolia	15	Removed
24	7"	Valley Oak/Quercus lobata	7	Removed
25	6"	Valley Oak/Quercus lobata	6	Removed
26	39"	Valley Oak/Quercus lobata	0	**Preserved**
27	5"	Hackberry/Celtis sp.	5	Removed
28	14"	Black Acacia/Acacia melanoxylon	EXEMPT	Removed
29	7,8"	Black Acacia/Acacia melanoxylon	EXEMPT	Removed
30	13"	Valley Oak/Quercus lobata	13	**May be removed**
31	7,11"	Coast Live Oak/Quercus agrifolia	18	**May be removed**
32	35"	Silver Maple/Acer saccharinum	EXEMPT	Removed
33	10,14"	Coast Live Oak/Quercus agrifolia	24	Removed
34	12"	Coast Live Oak/Quercus agrifolia	12	Removed
35	7"	Valley Oak/Quercus lobata	7	Removed
36	6"	Coast Live Oak/Quercus agrifolia	6	Removed
37	12"	Valley Oak/Quercus lobata	12	Removed
38	9"	Valley Oak/Quercus lobata	9	Removed
39	13"	Valley Oak/Quercus lobata	13	Removed
40	20" @ 3'	Fruitless Mulberry/Morus alba	EXEMPT	Removed
41	28" @ 3'	Coast Live Oak/Quercus agrifolia	28	**May be removed**
42	20"	Monterey Pine/Pinus radiata	EXEMPT	Removed

~ Trees To Be Removed ~			Diameter Removed (inches)	Status
Tree #	DBH	Species		
43	23"	Fruitless Mulberry/Morus alba	EXEMPT	Removed
44	8,11"	Coast Live Oak/Quercus agrifolia	19	Removed
45	7"	Coast Live Oak/Quercus agrifolia	7	Removed
46	21"	Coast Live Oak/Quercus agrifolia	21	Removed
47	10"	Coast Live Oak/Quercus agrifolia	10	Removed
48	4"	Valley Oak/Quercus lobata	4	Removed
49	18"	Fruitless Mulberry/Morus alba	EXEMPT	Removed
50	15"	Fruitless Mulberry/Morus alba	EXEMPT	Removed
51	15"	Coast Live Oak/Quercus agrifolia	15	Removed
52	27"	Fruitless Mulberry/Morus alba	EXEMPT	Removed
53	7"	Monterey Pine/Pinus radiata	EXEMPT	Removed
54	5,7,11"	Coast Live Oak/Quercus agrifolia	23	Removed
		Total Diameter to be Mitigated	565	
		Total Required Mitigation Trees	**188**	

Total Required Mitigation Trees = (Total"/6")* 2 Trees

CARLILE · MACY

REPLACEMENT TREES TABULATION

Per City of Santa Rosa Ordinance

PROJECT NAME: Penstemon Place
LOT NUMBERS: Lots 1 - 59
CM PROJECT #: 2015013.00
DATE: May 2018

Quantity	Size	Mitigation Value per Tree	Species	Mitigation Total
STREET TREES:				
15	24 " box	3	Ulmus parvifolia 'Allee' / Chinese Evergreen Elm	45
56	15 gal	1	Ulmus parvifolia 'Allee' / Chinese Evergreen Elm	56
63	15 gal	1	Lagerstroemia indica varieties / Crape Myrtle	63
FRONT YARD TREES:				
26	15 gal	1	Ginkgo biloba 'Princeton Sentry' / Maidenhair Tree	26
34	15 gal	1	Acer rubrum 'Bowhall' / Bowhall Red Map	34
20	15 gal	1	Quercus agrifolia / Coast Live Oak	20
			Mitigation Value of Replacement Trees	**244**

ATTACHMENT E

ENVIRONMENTAL NOISE ASSESSMENT

Penstemon Place Project

Illingworth & Rodkin, Inc.
July 13, 2017

PENSTEMON PLACE PROJECT ENVIRONMENTAL NOISE ASSESSMENT

Santa Rosa, California

July 13, 2017

Prepared for:

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ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
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Petaluma, CA 94954
(707) 794-0400

Project: 17-028

INTRODUCTION

The project proposes the construction of 59 new single-family residences on 9.7 acres of rural residential land located in the northeast corner of the Taylor Mountain Place/Linwood Avenue intersection in Santa Rosa, California. Currently, the site is mostly vacant with six existing residences from the 1960s. As part of the proposed project, these residences would be demolished. The project site is surrounded by existing single-family residences. The future Farmers Lane Extension Project is planned adjacent to the eastern boundary of the project site.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses the noise and land use compatibility of the project with respect to the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts to off-site receptors, provides a discussion of each project impact, and presents mitigation measures, where necessary, to reduce significant impacts to less-than-significant levels.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a

method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 p.m. - 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. - 7:00 a.m.) noise levels. The *Day/Night Average Sound Level* (L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reactions of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background - Noise

The State of California and the City of Santa Rosa have established regulatory criteria that are applicable in this assessment. The California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. CEQA contains guidelines to evaluate the significance of noise and vibration impacts attributable to a proposed project. Under CEQA, impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

City of Santa Rosa General Plan 2035. The City of Santa Rosa's General Plan[1] includes the Noise and Safety Element, which provides guidelines to achieve the goal of maintaining an acceptable community noise level. The following goals and policies are applicable to the proposed project:

NS-B **Maintain an acceptable community noise level to protect the health and comfort of people living, working and/or visiting in Santa Rosa, while maintaining a visually appealing community.**

NS-B-1 Do not locate noise-sensitive uses in proximity to major noise sources, except residential is allowed near rail to promote future ridership.

NS-B-2 Encourage residential developers to provide buffers other than sound walls, where practical. Allow sound walls only when projected noise levels at a site exceed land use compatibility standards in Figure 12-1.

In some established neighborhoods and subdivisions, sound walls may provide the only alternative to reduce noise to acceptable community standards. The Design Review process shall evaluate sound wall aesthetics and landscaping to ensure attractiveness along with functionality.

NS-B-3 Prevent new stationary and transportation noise sources from creating a nuisance in existing developed areas. Use a comprehensive program of noise prevention through planning and mitigation, and consider noise impacts as a crucial factor in project approval.

The Land Use Compatibility Standards specify normally acceptable levels for community noise in various land use areas.

NS-B-4 Require new projects in the following categories to submit an acoustical study, prepared by a qualified acoustical consultant:

- All new projects proposed for areas with existing noise above 60 dBA DNL. Mitigation shall be sufficient to reduce noise levels below 45 dBA DNL in habitable rooms and 60 dBA DNL in private and shared recreational facilities. Additions to existing housing units are exempt.

[1] *Santa Rosa General Plan 2035*, November 3, 2009.

- All new projects that could generate noise whose impacts on other existing uses would be greater than those normally acceptable (as specified in the Land Use Compatibility Standards).

NS-B-5 Pursue measures to reduce noise impacts primarily through site planning. Engineering solutions for noise mitigation, such as sound walls, are the least desirable alternative.

NS-B-6 Do not permit existing uses to generate new noises exceeding normally acceptable levels unless:

- Those noises are mitigated to acceptable levels; or

- Th e activities are specifically exempted by the City Council on the basis of community health, safety, and welfare.

NS-B-8 Adopt mitigations, including reduced speed limits, improved paving texture, and traffic controls, to reduce noise to normally acceptable levels in areas where noise standards may be exceeded (e.g., where homes front regional/arterial streets and in areas of mixed use development.)

NS-B-9 Encourage developers to incorporate acoustical site planning into their projects. Recommended measures include:

- Incorporating buffers and/or landscaped earth berms;

- Orienting windows and outdoor living areas away from unacceptable noise exposure;

- Using reduced-noise pavement (rubberized-asphalt);

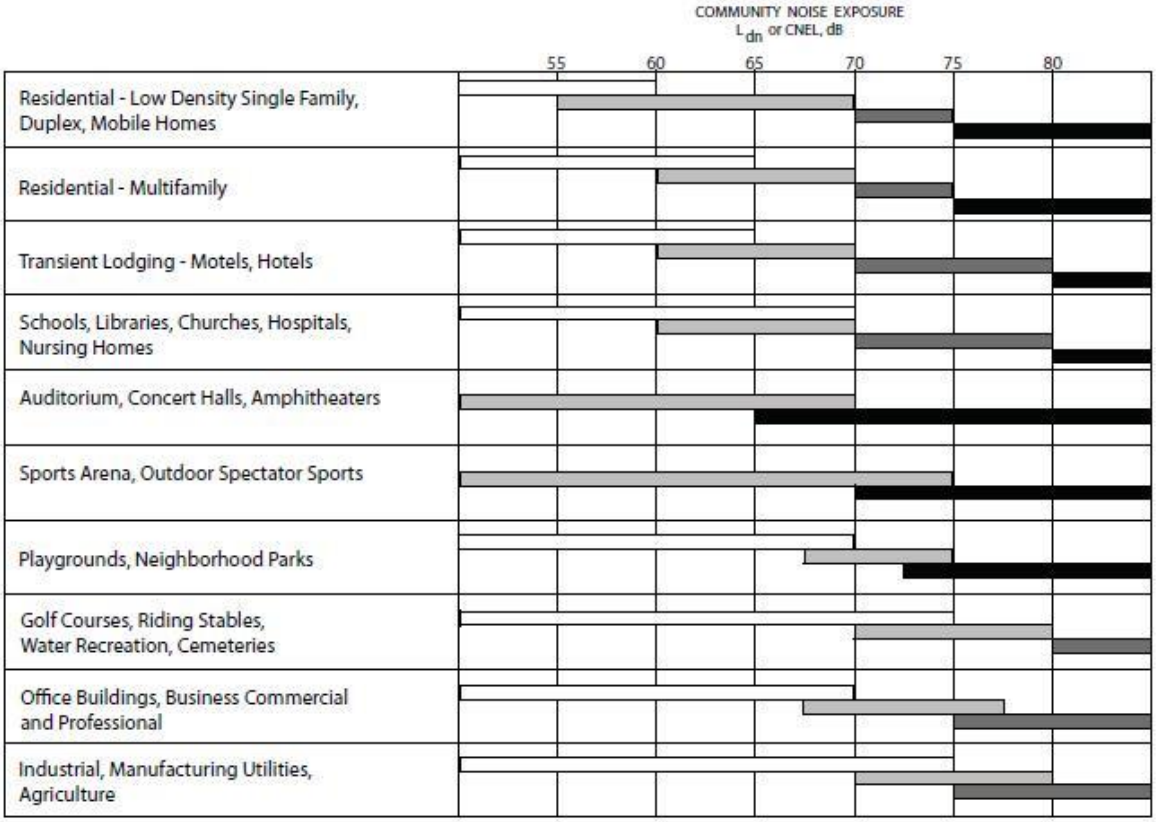
- Incorporating traffic calming measures, alternative intersection designs, and lower speed limits; and

- Incorporating state-of-the-art structural sound attenuation and setbacks.

NS-B-14 Discourage new projects that have potential to create ambient noise levels more than 5 dBA DNL above existing background, within 250 feet of sensitive receptors.

Figure 12-1

Land Use Compatibility Standards



LEGEND:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: Environmental Science Associates, 2001

Source: Santa Rosa General Plan 2035, 2009.

***Santa Rosa Noise Ordinance*.** The City of Santa Rosa has adopted a quantitative noise ordinance in Chapter 17-16 of the Santa Rosa Noise Ordinance. Section 17-16.120 regulates noise from stationary machinery and equipment:

> *"It is unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels."*

The ambient base noise levels for residential, office, commercial, and industrial areas are established in Section 17-16.030. The applicable ambient noise level criteria are shown in Table 4.

TABLE 4 Santa Rosa Noise Ordinance Ambient Base Noise Levels

Land Use Zone	Daytime Level (7:00 a.m. to 7:00 p.m.)	Evening Level (7:00 p.m. to 10:00 p.m.)	Nighttime Level (10:00 p.m. to 7:00 a.m.)
Single-Family Residential (R1 and R2)	55 dBA	50 dBA	45 dBA
Multi-Family Residential	55 dBA	55 dBA	50 dBA
Office and Commercial	60 dBA	60 dBA	55 dBA
Intensive Commercial	65 dBA	65 dBA	55 dBA
Industrial	70 dBA	70 dBA	70 dBA

Source: Santa Rosa Noise Ordinance 17-16.030.

The Noise Ordinance defines ambient noise as follows:

> *"Ambient noise is the all-encompassing noise associated with a given environment usually a composite of sounds from many sources near and far. For the purpose of this chapter, ambient noise level is the level obtained when the noise level is averaged over a period of 15 minutes without inclusion of noise from isolated identifiable sources at the location and time of day near that at which a comparison is to be made."*

Existing Noise Environment

The project site is located in the northeast corner of the Taylor Mountain Place/Linwood Avenue intersection in the City of Santa Rosa. Single-family residential land uses surround the project site to the north, to the south, to the west, and to the east. The site is currently developed with six rural single-family residences.

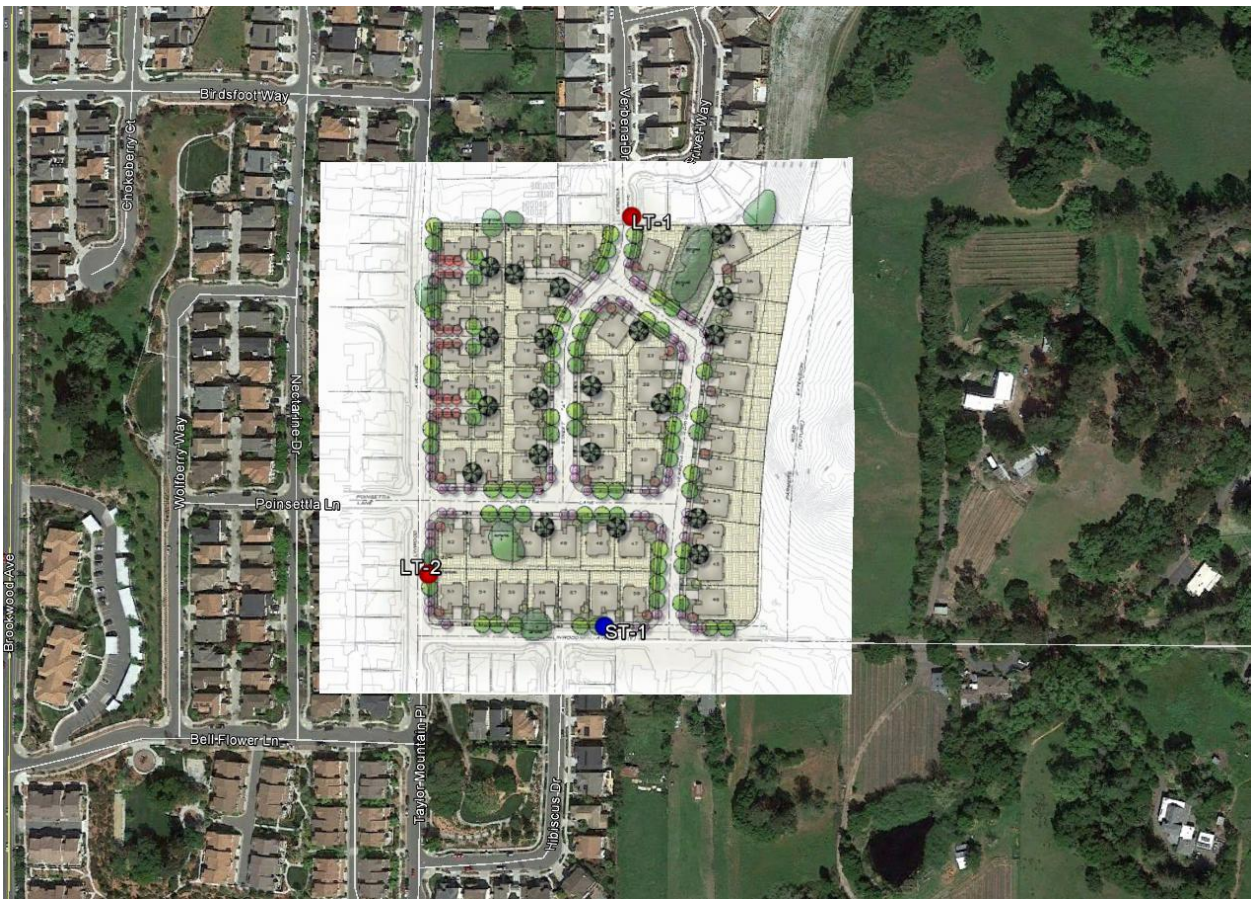
A noise monitoring survey was performed at the site beginning on Thursday March 2, 2017 and concluding on Friday March 3, 2017. The monitoring survey included two long-term noise measurements and one short-term noise measurement, which are shown in Figure 1. Traffic noise along the local roadways that serve the project site is the predominant source of environmental noise. Occasional overhead aircraft associated with the Charles M. Schulz-Sonoma County Airport are also audible at times at the site.

Long-term noise measurement LT-1 was made from a utility pole approximately 15 feet east of the centerline of Verbena Drive and approximately 10 feet above the ground. Hourly average noise levels at this location typically ranged from 41 to 51 dBA L_{eq} during the day, and from 39 to 50 dBA L_{eq} at night. The day-night average noise level from Thursday March 2, 2017 through Friday March 3, 2017 was 51 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figure 2.

LT-2 was made from a utility pole approximately 20 feet east of the centerline of Linwood Avenue and approximately 10 feet above the ground. Hourly average noise levels at this location typically ranged from 51 to 60 dBA L_{eq} during the day, and from 39 to 58 dBA L_{eq} at night. The day-night average noise level from Thursday March 2, 2017 through Friday March 3, 2017 was 60 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figure 3.

The short-term measurement (ST-1) was made on Thursday March 2, 2017 in a ten-minute interval starting at 11:00 a.m. ST-1 was made along the southern boundary of the project site, approximately 20 feet north of the centerline of Linwood Avenue. The ten-minute average noise level measured at ST-1 was 39 dBA $L_{eq(10\text{-}min)}$, and the estimated day-night average level was 41 dBA DNL. All data collected at ST-1 are summarized in Table 5.

FIGURE 1 Noise Measurement Locations



Source: Google, 2016.

FIGURE 2 Daily Trend in Noise Levels at LT-1, Thursday, March 2, 2017 through Friday, March 3, 2017

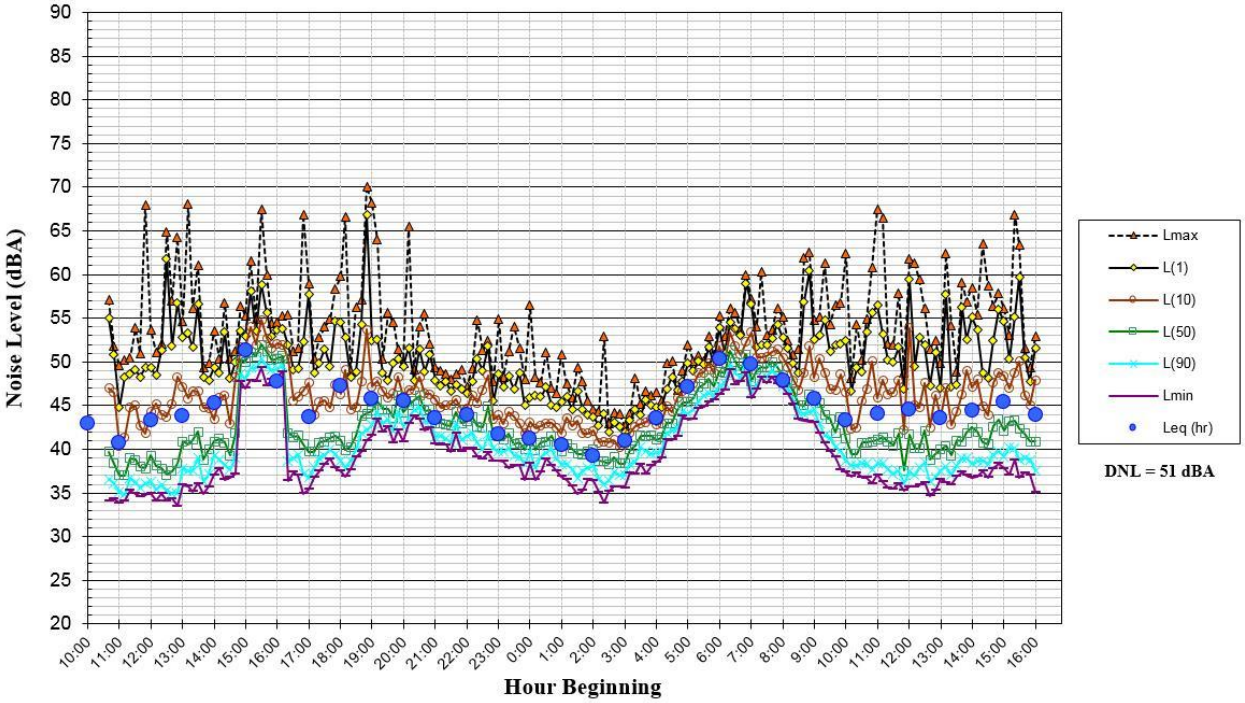


FIGURE 3 Daily Trend in Noise Levels at LT-2, Thursday, March 2, 2017 through Friday, March 3, 2017

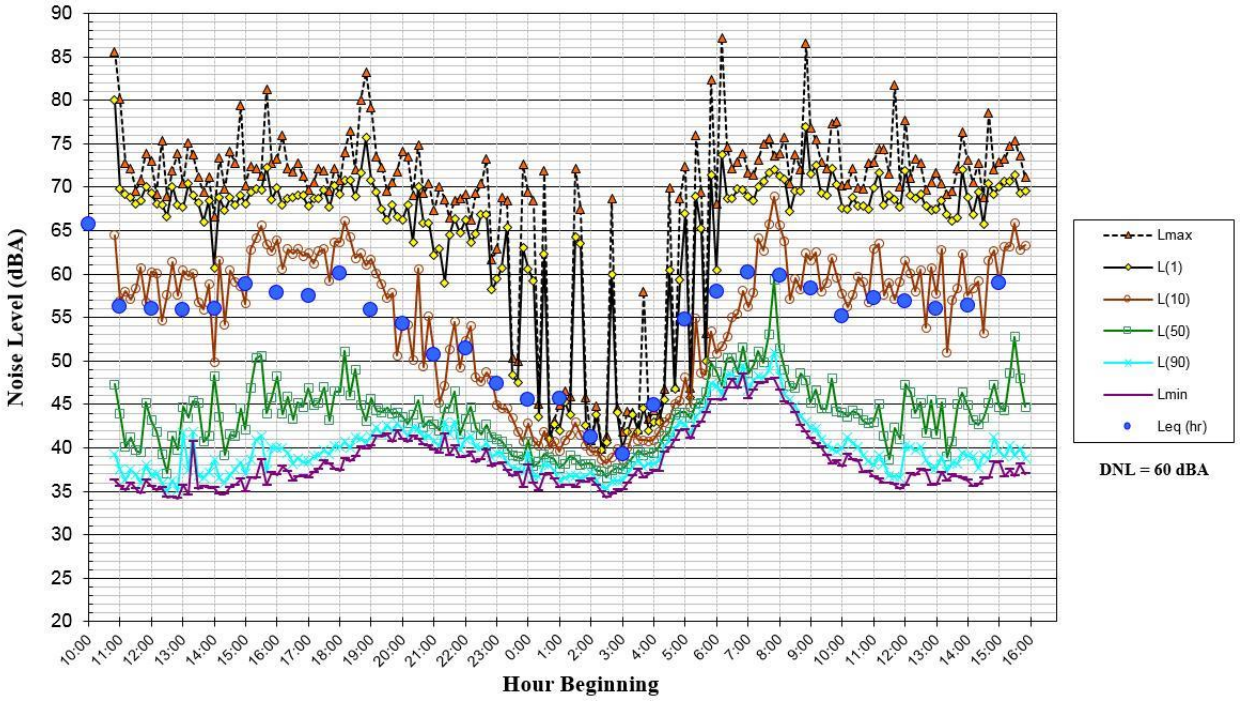


TABLE 5 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10)}$	DNL[a]
ST-1: ~20 feet north of the centerline of Linwood Drive	3/2/2017, 11:00-11:10	58	48	41	35	34	39	<50

[a] DNL was approximated by correlating to corresponding period at long-term site.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The compatibility of proposed exterior use areas is assessed against the Land Use Compatibility Standards established in the City of Santa Rosa General Plan. The City of Santa Rosa considers residential exterior use areas in single-family residential developments "normally acceptable" in noise environments of 60 dBA DNL or less. Interior noise levels shall be maintained so as not to exceed 45 dB DNL.

Future Exterior Noise Environment

The future noise environment at the project site would result primarily from vehicular traffic along the future Farmers Lane extension that is planned along the eastern boundary of the project site. Traffic along neighborhood roadways serving the project site and vicinity would also affect the noise environment on the project site. To estimate the future traffic levels at the backyards of the proposed single-family residences adjacent to the future Farmers Lane extension, an acoustical model of the project site and the surrounding area was created using the Federal Highway Administration's (FHWA) Traffic Noise Model, version 2.5 (TNM). Based on the project description, the roadway elevation of the future Farmers Lane extension would be situated on the hillside above project site in order to mitigate traffic noise at the site without the inclusion of sound barriers. For the purposes of this project, an average daily traffic (ADT) volume of 14,100 vehicles is assumed along the Farmers Lane extension. To model the worst hour scenario in TNM, it was assumed that 10% of the ADT would occur during the peak traffic hour. Additionally, a traffic study for the proposed project was completed in April 2017 by *W-Trans*.[2] Included in the study were peak hour traffic volumes for the Linwood Avenue/Poinsettia Lane intersection. These traffic volumes were also used as inputs in the TNM model.

The backyards of proposed residential units would be subject to the City's "normally acceptable" noise and land compatibility standards, which Figure 12-1 of the City's General Plan identifies as 60 dBA DNL. Typically, noise levels are assessed in the center of the backyard areas, at least five feet from any nearby reflective surfaces, such as the residential units or noise barriers. The backyards, which are shown in pale yellow in Figure 1, for residences 35 through 46 adjoin the future Farmers Lane extension; however, the extended backyards of these residences include a significant elevation increase from the residential pad elevation to the future roadway surface of the Farmers Lane extension. Therefore, the receptors for these backyards were positioned at the

[2] W-Trans, "Draft Report Traffic Impact Study for the Penstemon Place," April 7, 2017.

base of the slope, five-feet above the residential pad elevation. According to the site plan, a six-foot solid wooden privacy fence would be located along the backyard and side yard perimeters of each residence on the project site. This privacy fence was not included in the TNM model in order to show the unmitigated traffic noise levels.

Based on the results of the traffic noise model, residences 35 through 45 would be exposed to unmitigated future noise levels resulting from Farmers Lane extension below 60 dBA DNL. Residence 46, which is located at the future corner of Farmers Lane and Linwood Avenue would result in future exterior noise levels up to 61 dBA DNL. Due to greater setbacks from the Farmers Lane extension, the low volumes of the neighborhood roadways, and proposed residential structures providing partial shielding from the traffic noise, the remaining residences throughout the project site would be exposed to future exterior noise levels at or below 60 dBA DNL.

Residences 1, 3, 5, 7, 9, 11, 13, 52, and 53 are adjacent to Linwood Avenue, and the backyards of each of these residences would have direct line-of-sight to the traffic along the roadway. With the center of each of these backyards set back approximately 60 feet, the future exterior noise levels due to traffic noise along Linwood Avenue would be below 60 dBA DNL. Residences 53 through 59 are adjacent to the Linwood Avenue alignment in the east-west direction; however, the front yards of these residences would be facing the roadway, and the structures would provide adequate shielding from the traffic noise along this roadway.

The backyards of the residences located on the interior of the site would have great enough setbacks from roadways and adequate shielding provided by the intervening residential structures to result in future noise levels below 60 dBA DNL.

While most of the residences would meet the City's 60 dBA DNL threshold for exterior noise levels, future noise levels at the backyard of residence 46 is expected to exceed the "normally acceptable" threshold by up to 1 dBA DNL. However, a solid six-foot privacy fence is expected to be constructed along the perimeter of the backyards of each residence. With the inclusion of acoustical shielding provided by this fence, the noise levels at the backyard of residence 46 would be less than 60 dBA DNL meeting the City's "normally acceptable" noise level threshold for private outdoor use areas in new single-family developments.

Future Interior Noise Environment

Based on the TNM results discussed above, the first floors of residences 35 through 46, which are adjacent to the future Farmers Lane extension, would be exposed to future exterior noise levels up to 61 dBA DNL. However, due to the elevation of the roadway being approximately 20 feet above the pad elevation of the residences, the rooms on the second floors of these residences would be exposed to future exterior noise levels up to 64 dBA DNL.

The southern façades of residences 53 through 59 would be set back from the centerline of Linwood Drive (east-west alignment) by approximately 40 to 55 feet, and the western façades of residences 1, 3, 5,7, 9, 11, 13, 52, and 53 would have setbacks of approximately 40 feet from the

centerline of Linwood Avenue. At these distances, the rooms facing these roadways would be exposed to future exterior noise levels below 60 dBA DNL.
All residences located on the interior of the site would receive adequate shielding from the intervening buildings. The exterior-facing façades of the residences located on the interior of the site would be exposed to future exterior noise levels below 60 dBA DNL.

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Assuming windows to be partially open, the interior noise levels for the proposed project would be up to 49 dBA DNL at the exterior-facing rooms adjacent to the future Farmers Lane extension. This would exceed the 45 dBA DNL threshold for interior noise levels.

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA DNL or less:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

The implementation of these noise insulation features would reduce interior noise levels to 45 dBA DNL or less.

Aircraft Noise

Charles M. Schulz Sonoma County Airport is a public airport located over 8.1 miles northwest of the project site. According to the Sonoma County General Plan 2020 Air Transportation Element, the project site lies outside the 55 dBA CNEL noise contour for this airport. Noise from aircraft would not substantially increase traffic noise levels expected at the project site, and interior noise levels resulting from aircraft would be compatible with the proposed project.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.

- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant impact would be identified if traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. The City of Santa Rosa discourages new projects that have potential to create ambient noise levels more than 5 dBA DNL above existing background, within 250 feet of sensitive receptors.

- A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: **Noise Levels in Excess of Standards.** The proposed project could potentially generate noise in excess of standards established in the City's Municipal Code at the nearby sensitive receptors. **This is a significant impact.**

Section 17-16.120 of the City's Noise Ordinance limits noise levels produced by stationary mechanical equipment to 60 dBA during daytime hours (7:00 a.m. to 7:00 p.m.), to 55 dBA during evening hours (7:00 p.m. to 10:00 p.m.), and to 50 dBA at night (10:00 p.m. to 7:00 a.m.) at single-family residential property lines.

The proposed project would include mechanical equipment such as heating, ventilation, and air conditioning systems. Information regarding the location, number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. While the site plan does not show the location of the air conditioning units, this type of equipment is typically located on the ground floor around the perimeter of the residential structures. Typically, air conditioning units are located on the sides or back of the residences.

Typical air conditioning units and heat pumps for single-family residences generate noise levels of about 60 dBA L_{eq} at a distance of 50 feet. This type of equipment could run continuously during the daytime and nighttime. Along the northern boundary of the project site, the proposed

project has a shared property line with existing single-family residences. Assuming worst-case scenario conditions, air conditioning units for the proposed residences would be located within 15 to 25 feet of the shared property line. At these distances, the project-generated mechanical equipment noise would range from 66 to 71 dBA L_{eq}. With the inclusion of the six-foot wooden privacy fence along the shared perimeter line, these noise levels would reduce by approximately 5 dBA. The expected mechanical equipment noise levels would potentially exceed the City's daytime, evening, and nighttime noise levels. This would be a potentially significant impact.

Mitigation Measure 1:

Mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's noise level requirements. A qualified acoustical consultant shall be retained to review mechanical noise as these systems are selected to determine specific noise reduction measures necessary to reduce noise to comply with the City's noise level requirements. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers such as enclosures and parapet walls to block the line-of-sight between the noise source and the nearest receptors. Alternate measures may include locating equipment in less noise-sensitive areas, where feasible.

Impact 2: **Exposure to Excessive Groundborne Vibration.** Construction-related vibration caused by some types of construction activity could be in excess of 0.3 in/sec PPV at the existing residences located adjacent to the project site. **This is a significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition, preparation work, foundation work, and new building framing and finishing. The proposed project would not require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. While no historical buildings or buildings that are documented to be structurally weakened adjoin the project site, details regarding the residences surrounding the project site were not provided at the time of this study. For the purposes of this study, therefore, groundborne vibration levels exceeding the conservative 0.3 in/sec PPV limit would have the potential to result in a significant vibration impact.

Table 6 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles,

compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

For the purposes of calculating vibration levels, the distances provided here reflect the distances from the existing residential structures to the project site. The nearest structures to the project site are residential dwellings adjacent to the north. These residences range from within 10 feet from the shared property line to 50 feet. Vibration levels at these distances would range from 0.01 to 0.58 in/sec PPV, which exceeds the 0.3 in/sec PPV significance threshold at the nearest residences. To the south, opposite Linwood Avenue, the nearest single-family residential structures are approximately 60 to 70 feet from the project's southern boundary. At these distances, vibration levels would be range from 0.07 to 0.08 in/sec PPV. The single-family residence to the east of the project site is approximately 325 feet from the project site, which would result in vibration levels up to 0.01 in/sec PPV. The residences to the west of the project site, opposite Linwood Avenue, would range from 55 to 80 feet from the project's western boundary. At these distances, vibration levels would range from 0.06 to 0.09 in/sec PPV.

Construction activity for the proposed project could potentially result in "architectural" damage to the residences adjacent to the site to the north. This is a significant impact.

TABLE 6 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

Mitigation Measure 2:

Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy objects, within 20 feet of any adjacent residences.

The implementation of this mitigation measure would reduce the impact to a less-than-significant level.

Impact 3: **Permanent Noise Level Increase.** The proposed project is not expected to result in a substantial permanent noise level increase due to project-generated traffic at the existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

Based on Policy NS-B-14 of the City of Santa Rosa General Plan, a significant impact would occur if the proposed project would result in a permanent noise level increase due to project-generated traffic of 5 dBA DNL or greater at sensitive receptors located within 250 feet of the project site. For reference, a 5 dBA DNL noise increase would be expected if the project would triple existing traffic volumes along a roadway.

The project trips included in the traffic study completed by *W-Trans* for the proposed project were added to the existing peak hour traffic volumes to generate existing plus project peak hour volumes. When comparing the existing plus project volumes to the existing volumes, the noise level increase due to project-generated traffic was 1 dBA DNL along Linwood Avenue/Taylor Mountain Place in the vicinity of the project site. At all other roadway segments included in the traffic study, the resulting noise level increase due to project-generated traffic was less than 1 dBA DNL. This impact is a less-than-significant impact.

Mitigation Measure 3: **None required.**

Impact 4: **Cumulative Noise Increase.** The proposed project would not make a cumulatively considerable contribution to future noise levels at residential land uses in the project vicinity. **This is a less-than-significant impact.**

A significant impact would occur if the cumulative traffic noise level increase was 5 dBA DNL or greater and if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA DNL or more attributable solely to the proposed project.

The project trips were added to the future traffic volumes included in the traffic study, and both future peak hour traffic scenarios (i.e., future no project and future plus project) were compared to the existing peak hour traffic volumes. While traffic noise increases of 5 dBA DNL or more were calculated along Linwood Avenue, north of Aston Avenue, and along Kawana Springs Road, to the east and west of Taylor Mountain Place, these traffic noise increases were calculated for both future scenarios (with and without the project). At all other roadway segments included in the traffic study, the calculated traffic noise increase was less than 5 dBA DNL under both future scenarios. Since the traffic noise level increase of both future scenarios would be the same with and without the project, the proposed project would not make a cumulatively considerable contribution to increased noise levels at any roadway segments. This impact is a less-than-significant impact.

Mitigation Measure 4: **None required.**

Impact 5: **Temporary Construction Noise.** Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to project construction activities. The incorporation of construction best management practices as project conditions of approval would result in a **less-than-significant** temporary noise impact.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

The City of Santa Rosa does not define allowable construction hours in the General Plan or Municipal Code, but assuming that construction would be limited to daytime hours only, temporary construction noise would be considered a significant impact where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive uses in the project vicinity for a period exceeding one year.

To the north, existing residential land uses share a property line with the project site, and the existing daytime ambient noise levels at these residences would range from 41 to 51 dBA L_{eq}, as measured at LT-1. Existing residences to the south and to the west, which are both opposite Linwood Avenue, would have daytime ambient noise levels ranging from 51 to 60 dBA L_{eq}, as measured at LT-2. Ambient levels for the nearest rural residences, who's property line is approximately 255 feet east of the project site, would have similar daytime ambient noise levels to those measured at LT-1, which would range from 41 to 51 dBA L_{eq}.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source (Table 7). Typical hourly average construction-generated noise levels for residential developments are about 81 to 88 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.), as shown in Table 8. Hourly average construction noise levels associated with the erection of the structures, such as hammer- and drilling-related noise, range from approximately 63 to 71 dBA L_{eq} at a distance of 50 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA noise reduction at distant receptors.

Construction is expected to begin in early May 2019 and is expected to be completed in mid-October 2020, which would be a total of 17.5 months. This would exceed one year. Construction activities would include site preparation, excavation, grading, trenching, building construction, paving, and architectural coating. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Table 9 shows the average noise level ranges, by construction phase. Once construction moves

indoors, minimal noise would be generated at off-site locations. The range of levels for the trenching phase reflects the period from mid-July 2019 to mid-September 2019 when this phase would overlap with the grading/excavation phase. Similarly, the range of levels for the building-interior/architectural coating phase reflects the period from early January 2020 to mid-October 2020 when this phase would overlap with the building-exterior phase.

As shown in Table 9, noise levels would exceed 60 dBA L_{eq} at the nearby residences throughout the project construction. Ambient levels at the surrounding residences would be exceeded by more than 5 dBA L_{eq} throughout project construction. Since construction activities are expected to last more than one year and noise for the proposed project is expected to exceed the City's daytime threshold of 60 dBA L_{eq} at the existing residential property lines and exceed ambient levels at the nearby residences by more than 5 dBA L_{eq}, this would be a significant impact.

TABLE 7 Construction Equipment, 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes: [1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 8 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 9 Estimated Construction Noise Levels at the Nearby Residences

Phase	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average L_{eq} at Residence, dBA			
			North Res	South Res	East Res	West Res
Site Preparation	5/1/2019-5/14/2019	Rubber-Tired Dozer (3) Tractor/Loader/Backhoe (4)	102	88	75	89
Grading/ Excavation	5/15/2019-9/15/2019	Excavator (1) Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	101	87	74	88
Trenching	7/15/2019-9/15/2019	Tractor/Loader/Backhoe (1) Excavator (1)	96-102[a]	82-88[a]	69-75[a]	83-89[a]
Building-Exterior	10/16/2019-10/15/2020	Crane (1) Forklift (3) Generator Set (1) Tractor/Loader/Backhoe (3) Welder (1)	100	86	73	87
Building-Interior/ Architectural Coating	1/1/2020-12/31/2020	Air Compressor (1) Aerial Lift (1)	89-100[b]	75-86[b]	62-74[b]	76-87[b]
Paving	9/15/2019-10/15/2019	Paver (2) Paving Equipment (2) Roller (2)	101	87	74	87

[a] The range of levels for the trenching phase reflects the trenching equipment only and the overlapping period with the grading/excavation phase.
[b] The range of levels for the building-interior/architectural coating phase reflects the building-interior/architectural coating equipment only and the overlapping period with the building-exterior phase.

Mitigation Measure 5:

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life.

The City shall require the contractor to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Limit construction hours to between 7:00 a.m. and 7:00 p.m., Monday through Friday.

- Avoid overlapping construction phases, where feasible.

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- The contractor shall prepare a detailed construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

The implementation of the reasonable and feasible controls outlined above would reduce construction noise levels emanating from the site by 5 to 10 dBA in order to minimize disruption and annoyance. With the implementation of these controls, and considering that construction is temporary, the impact would be reduced to a less-than-significant level.

ATTACHMENT F

GEOTECHNICAL STUDY REPORT

McIntosh Property Subdivision, Linwood Avenue

RGH Consultants
November 30, 2015

RGH CONSULTANTS

Experience is the difference

GEOTECHNICAL STUDY REPORT

McINTOSH PROPERTY SUBDIVISION
LINWOOD AVENUE
SANTA ROSA, CALIFORNIA

Project Number:

5027.09.04.1

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INTRODUCTION

This report presents the results of our geotechnical study for the McIntosh Property Subdivision to be constructed on Linwood Avenue in Santa Rosa, California. The 10½ acre property extends over relatively level to moderately sloping terrain and contains six unoccupied single-family residences. The site location is shown on Plate 1, Appendix A.

We understand the existing structures will be removed and the property will be subdivided into 65 single-family residential lots. We anticipate one- and two-story, wood-frame structures with raised wood floors supported on drilled pier or spread footing foundations. Retaining walls will be needed to provide level breaks across the building site. Auto access will be provided by a paved roadway.

Actual foundation loads are not known at this time. We anticipate the loads will be typical for the light to moderately heavy type of construction planned and that wall loads will range from about ¾ to 1½ kips per lineal foot.

Grading plans are not available, but we anticipate that the planned grading will be the minimum amount needed to construct level building pads and provide paved areas with positive drainage. Such grading could include cuts and fills of about 5 to 10 feet.

Utility plans are not available, but we have assumed for this study that the project utilities will extend no deeper than 5 feet below the existing ground surface. If project utilities extend deeper, supplemental exploration may be required to evaluate the soil and bedrock conditions within and below the utility excavations.

SCOPE

The purpose of our study, as outlined in our Professional Service Agreement dated September 25, 2015 was to generate geotechnical information for the design and construction of the project. Our scope of services included reviewing selected published geologic data pertinent to the site; evaluating subsurface conditions with test pits and laboratory tests; analyzing the field and laboratory data; and presenting this report with the following geotechnical information:

1. A brief description of soil, bedrock and groundwater conditions observed during our study;

2. A discussion of seismic hazards that may affect the proposed development; and

3. Conclusions and recommendations regarding:

    a. Primary geotechnical engineering concerns and mitigating measures, as applicable;

    b. Site preparation and grading including remedial grading of weak, porous, compressible and/or expansive, surface soils and the construction of hillside fills;

    c. Foundation type(s), design criteria, and estimated settlement behavior;

    d. Lateral loads for retaining wall design;

e. Support of concrete slabs-on-grade;

f. Preliminary pavement thickness based on our experience with similar soils and projects and the results of an R-value test on the anticipated subgrade soils;

g. Utility trench backfill;

h. Geotechnical engineering drainage improvements; and

i. Supplemental geotechnical engineering services.

STUDY

Site Exploration

We reviewed our previous geotechnical studies in the vicinity and selected geologic references pertinent to the site. The geologic literature reviewed is listed in Appendix B.

On October 16, 2015, we performed a geotechnical reconnaissance of the site and explored the subsurface conditions by excavating eleven test pits to depths ranging from about 1 to 11 feet. The test pits were excavated with a track-mounted excavator at the approximate locations shown on the Exploration Plan, Plate 2. The test pit locations were determined approximately by pacing their distance from features shown on the Exploration Plan and should be considered accurate only to the degree implied by the method used. Our geologist located and logged the test pits and obtained samples of the materials encountered for visual examination, classification and laboratory testing. Disturbed “bulk” samples were obtained at selected depths from the test pits and placed in plastic bags and buckets.

The logs of the test pits showing the materials encountered, groundwater conditions and sample depths are presented on Plates 3 through 6. The soils are described in accordance with the Unified Soil Classification System, outlined on Plate 7. Bedrock is described in accordance with Engineering Geology Rock Terms, shown on Plate 8.

The test pit logs show our interpretation of subsurface soil and bedrock conditions on the date and at the locations indicated. Subsurface conditions may vary at other locations and times. Our interpretation is based on visual inspection of soil and bedrock samples, laboratory test results, and interpretation of excavation and sampling resistance. The location of the soil and bedrock boundaries should be considered approximate. The transition between soil and bedrock types may be gradual.

Laboratory Testing

The samples obtained from the test pits were transported to our office and re-examined to verify soil classifications, evaluate characteristics, and assign tests pertinent to our analysis. Selected samples were laboratory tested to determine their classification (Atterberg Limits, percent of silt

and clay), expansion potential (Expansion Index - EI) and R-value. Results of the classification, expansion potential, and R-value tests are presented on Plates 9 and 10.

SITE CONDITIONS

General

Sonoma County is located within the California Coast Range geomorphic province. This province is a geologically complex and seismically active region characterized by sub-parallel northwest-trending faults, mountain ranges and valleys. The oldest bedrock units are the Jurassic-Cretaceous Franciscan Complex and Great Valley sequence sediments originally deposited in a marine environment. Subsequently, younger rocks such as the Tertiary-age Sonoma Volcanics group, the Plio-Pleistocene-age Clear Lake Volcanics and sedimentary rocks such as the Guinda, Domengine, Petaluma, Wilson Grove, Cache, Huichica and Glen Ellen formations were deposited throughout the province. Extensive folding and thrust faulting during late Cretaceous through early Tertiary geologic time created complex geologic conditions that underlie the highly varied topography of today. In valleys, the bedrock is covered by thick alluvial soils.

Geology

Published geologic maps (McLauglhin et al., 2008) indicate the property is underlain by three geologic units. The western and southern portion of the site is underlain by the Pliocene and Miocene age Petaluma Formation, which is comprised of sandy to silty gravel, silty sandstone, siltstone and mudstone. The central and northern portion of the site is underlain by Holocene age alluvium which is comprised of gravel, sand and silt. The eastern portion of the site is underlain by an andesite, basaltic andesite and basalt unit of the Pliocene and Miocene age Sonoma Volcanics group.

Landslides

Published landslide maps (Huffman, 1980) do not indicate large-scale slope instability at the site, and we did not observe active landslides at the site during our study.

Surface

The property extends primarily over relatively level to moderately sloping terrain. The vegetation consists of annual grasses and scattered oak trees. Our understanding is that the entire site is to be developed.

In general, the ground surface is soft and spongy. This is a condition generally associated with weak, porous surface soils. Locally the surface soils are disturbed by randomly arrayed shrinkage cracks generally associated with expansive soils. Expansive soils shrink and swell with the weather cycle. The cyclic shrinking and swelling tends to disturb the upper portion of the expansive clay. This zone is defined hereinafter as the active layer.

Natural drainage consists of sheet flow over the ground surface that concentrates in man-made surface drainage elements such as roadside ditches, canals and gutters, and natural drainage elements such as swales, ravines, and creeks.

Subsurface

Our test pits and laboratory tests indicate that the portion of the site we studied is blanketed by ½ to 3 feet of weak, porous, compressible, clayey soils. Porous soils appear hard and strong when dry but become weak and compressible as their moisture content increases towards saturation. Along the western portion of the site and a portion of the southeastern part of the site the surface soils exhibit high plasticity (LL = 64-82; PI = 36-65), low to very high expansion potential (EI = 21-189), and are disturbed by ½ to 1 inch wide shrinkage cracks that extend 2 to 3 feet below the ground surface. The surface soils are covered by about 5 feet of heterogeneous fill along the western side of the building pad for the vacant residence directly across from Hibiscus Drive. Heterogeneous fill is a material with varying density, strength, compressibility and shrink-swell characteristics that often has an unknown origin and placement history. These surface materials are underlain by completely weathered claystone bedrock to depths of 6, to greater than 10 feet along the western portion of the site. Claystone, sandstone, tuff or andesite bedrock units were encountered beneath the surface materials across the site.

Claystone, sandstone, tuff or andesite bedrock extends from beneath the surface materials to the maximum depths explored (11 feet). The bedrock varies greatly across the site. The surface materials in the western portion of the site are underlain by stiff to moderately stiff clayey completely weathered bedrock and firm friable claystone bedrock. In the northwestern corner of the site the completely weathered bedrock is underlain by moderately hard, moderately strong andesite bedrock. The surface materials in the central and eastern portions of the site are underlain by firm to moderately hard, weak to moderately strong sandstone, tuff and andesite bedrock. Locally within these units we encountered refusal conditions with a Cat 304C excavator. A detailed description of the subsurface conditions found in our test pits is given on Plates 3 through 6, Appendix A. Based on Table 20.3-1 of American Society of Civil Engineers (ASCE) Standard 7-10, titled “Minimum Design Loads for Buildings and Other Structures” (2010), we have determined a Site Class of D should be used for the site.

Corrosion Potential

Mapping by the Natural Resources Conservation Service (2015) indicates that the corrosion potential of the near surface soil is high for uncoated steel and low to moderate for concrete. Performing corrosivity tests to verify these values was not part of our requested and/or proposed scope of work. Should the need arise, we would be pleased to provide a proposal to evaluate these characteristics.

Groundwater

Free groundwater was not observed in our test pits at the time of excavation. On hillsides, rainwater typically percolates through the porous surface materials and migrates downslope in the form of seepage at the interface of the surface materials and bedrock, and through fractures

in the bedrock. Fluctuations in the seepage rates typically occur due to variations in rainfall intensity, duration and other factors such as periodic irrigation.

DISCUSSION AND CONCLUSIONS

Seismic Hazards

General

We did not observe subsurface conditions within the portion of the property we studied that would suggest the presence of materials that may be susceptible to seismically induced densification or liquefaction. Therefore, we judge the potential for the occurrence of these phenomena at the site to be low.

Seismicity

Data presented by the Working Group on California Earthquake Probabilities (2007) estimates the chance of one or more large earthquakes (Magnitude 6.7 or greater) in the San Francisco Bay region within the next 30 years to be approximately 63 percent. Therefore, future seismic shaking should be anticipated at the site. It will be necessary to design and construct the proposed subdivision in strict adherence with current standards for earthquake-resistant construction.

Faulting

We did not observe landforms within the area that would indicate the presence of active faults and the site is not within a current Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). Therefore, we believe the risk of fault rupture at the site is low. However, the site is within an area affected by strong seismic activity. Several northwest-trending Earthquake Fault Zones exist in close proximity to and within several miles of the site (Bortugno, 1982). The shortest distances from the site to the mapped surface expression of these faults are presented in the table below.

ACTIVE FAULT PROXIMITY		
Fault	**Direction**	**Distance-Miles**
San Andreas	SW	20
Healdsburg-Rodgers Creek	NE	¼
Concord-Green Valley	SE	27
Cordelia	SE	32¼
West Napa	SE	26¼
Maacama	N	11¼

Lurching

Seismic slope failure or lurching is a phenomenon that occurs during earthquakes when slopes or man-made embankments yield and displace in the unsupported direction. Provided the foundations are installed as recommended herein, and the proposed fills are adequately keyed into underlying bedrock material, as subsequently discussed, we judge the potential for impact to the proposed improvements from the occurrence of this phenomenon at the site is low. However, some of these secondary earthquake effects are unpredictable as to location and extent, as evidenced by the 1989 Loma Prieta Earthquake.

Geotechnical Issues

General

Based on our study, we judge the proposed subdivision can be built as planned, provided the recommendations presented in this report are incorporated into its design and construction. The primary geotechnical concerns during design and construction of the project are:

1. The presence of ½ to 5 feet of highly expansive, weak, porous, compressible, clayey surface soils and heterogeneous fill;

2. The detrimental effects of uncontrolled surface runoff and groundwater seepage on the long-term satisfactory performance of subdivisions, especially those constructed on hillsides given the erosion potential and porous nature of the surface soils; and

3. The strong ground shaking predicted to impact the site during the life of the project.

Heterogeneous Fill

Heterogeneous fills of unknown quality and unknown method of placement, such as those found at the site, can settle and/or heave erratically under the load of new fills, structures, slabs, and pavements. Footings, slabs, and pavements supported on heterogeneous fill could also crack as a result of such erratic movements. Thus, where not removed by planned grading, the heterogeneous fill must be excavated and replaced as an engineered fill if it is to be used for structural support.

Weak, Porous Surface Soils

Weak, porous surface soils, such as those found at the site, appear hard and strong when dry but will lose strength rapidly and settle under the load of fills, foundations, slabs, and pavements as their moisture content increases and approaches saturation. The moisture content of these soils can increase as the result of rainfall, periodic irrigation or when the natural upward migration of water vapor through the soils is impeded by, and condenses under fills, foundations, slabs, and pavements. The detrimental effects of such movements can be reduced

by strengthening the soils during grading. This can be achieved by excavating the weak soils and replacing them as properly compacted (engineered) fill. Alternatively, satisfactory foundation support could be obtained below the weak surface soils.

Expansive Soil

Expansive soils were encountered along the western portion of the site and a portion of the southeastern part of the site. Expansive surface soils shrink and swell as they lose and gain moisture throughout the yearly weather cycle. Near the surface, the resulting movements can heave and crack lightly loaded shallow foundations (spread footings) and slabs. The zone of significant moisture variation is dependent on the expansion potential of the soil and the extent of the dry season. In the project area, the active layer is generally considered to range in thickness from about 2 to 3 feet. Stable foundation support needs to be obtained below this layer.

Foundation Support in Areas with Expansive Soils - We believe that satisfactory foundation support for the residences in areas with expansive soils can be obtained from a system of grade beams supported on drilled, cast-in-place, reinforced concrete piers that gain support below the zone of significant moisture variation.

Floor Systems in Areas with Expansive Soils - Because of expansive soils, slab-on-grade floors will heave and crack, and will not perform satisfactorily in residential living areas without remedial grading. However, wood floors supported above grade on joists that span the grade beams and/or isolated interior piers will perform well and can be used in living areas, as planned. Slab-on-grade floors can be used in garages provided that:

1. The subgrade materials comprise at least 12 inches of select fill and are pre-swelled by soaking prior to installation of the slabs;

2. The slabs are cast separate from foundations and framing to allow differential settlement or heave to occur without distressing the slabs or framing;

3. The slabs are reinforced to reduce cracks;

4. The slabs are grooved to induce cracking in a non-obtrusive manner; and

5. Some heave and cracking is acceptable to the user.

We estimate that the slabs will undergo from 1 to 3 inches of differential heave if they are constructed directly on the expansive soils.

Foundation Support in Areas with no Expansive Soils - Satisfactory foundation support for structures located outside of expansive soil areas can be obtained from spread footings that bottom at minimum depth on firm bedrock exposed by planned excavations or from spread footings supported on buttressed fills of equal thickness. Spread footings can also be used for foundation support where the building pad transitions from bedrock to fill and the fill is less than 3 feet thick, provided the fills are compacted to at least 95 percent relative compaction. We do

not recommend the use of drilled pier foundations in areas with shallow resistant bedrock due to potentially difficult drilling conditions.

Floor Systems in Areas with no Expansive Soils - Wood floors supported on joists above-grade can be used in living areas, as planned. Slab-on-grade floors can be used in the garages provided that:

1. The planned grading either removes the weak, surface soils or increases their supporting capacity by mechanical compaction;

2. The subgrade materials are pre-swelled by soaking prior to installation of the slabs;

3. Garage slabs are cast separate from foundations and framing to allow differential settlement or heave to occur without distressing the slabs or framing;

4. The slabs are reinforced to reduce cracks;

5. The slabs are grooved to induce cracking in a non-obtrusive manner; and

6. The slab area is underlain by firm rock, bedrock and fill (3 feet thick or less) placed at 95 percent relative compaction or buttressed fills of even thickness, entirely.

Excavation Difficulty

Site excavation will encounter hard, resistant bedrock a few feet below the surface. Site excavations, including utility trenches will require heavy ripping and jack hammering. The contractors and subcontractors bidding this job should read this report and become familiar with site conditions as they pertain to their operation and the appropriate equipment needed to perform their tasks. If more detailed information regarding excavatability of the bedrock is required, a seismic refraction study should be performed or additional test pits should be excavated using the type and size of equipment planned for construction.

Exterior Slabs and Pavements in Areas with Expansive Soils

Exterior slabs and pavements in areas with expansive soils will heave and crack as the expansive soils shrink and swell through the yearly weather cycle. Slab and pavement cracking and distress are typically concentrated along edges where moisture content variation is more prevalent within subgrade soils. Slab and pavement performance and the incidence of repair can be reduced, but not eliminated, by covering the pre-swelled expansive soils with at least 12 inches of select fill (see “On-Site Soil Quality” section) prior to constructing the slab or pavement required to carry the anticipated traffic.

Fill Support - Hillside fills need to be constructed on level keyways and benches excavated entirely on rock. However, regardless of the care used during grading, buttressed fills of uneven thickness such as those typically built on hillsides, will settle differentially. Satisfactory performance of structural elements constructed on hillside fills, such as pools, pool decks, garage slabs, and driveways will require the use of specialized grading techniques discussed in

the following sections of this report. These include excavating all surface soils and replacing these materials as a buttressed fill of even thickness or constructing the improvements entirely on cut. For the purpose of this discussion, fills with a differential thickness of less than 5 feet can be assumed to have equal thickness. In order to provide the equal thicknesses, it may be necessary to overexcavate at least a few feet in cut areas. Where the total fill thickness is less than 3 feet, the fill can be placed at 95 percent relative compaction in lieu of overexcavation in cut areas.

On-Site Soil Quality

All fill materials used in building areas where shallow spread footings will be used for foundation support and the upper 12 inches of garage and/or exterior slab and pavement subgrade must be select, as subsequently described in “Recommendations.” We anticipate that, with the exception of organic matter and of rocks or lumps larger than 6 inches in diameter, the excavated material generated from the upper elevations of the site will be suitable for re-use as general and select fill. Materials generated from the lower elevations of the site will not be suitable for select fill unless stabilized with lime.

Select Fill

The select fill can consist of approved on-site soils or import materials with a low expansion potential or lime stabilized on-site clayey soils. Lime stabilized soils may prevent the growth of landscape vegetation due to the inherent elevated pH level of the soil. The geotechnical engineer must approve the use of on-site soils as select fill during grading.

Settlement

If remedial grading is performed and the spread footings or drilled piers are installed in accordance with the recommendations presented in this report, we estimate that post-construction differential settlements across the building will be about ½ inch.

Surface Drainage

Because of topography and location, the site will be impacted by surface runoff from the upgradient slopes. In addition, the site soils are susceptible to erosion and sloughing. Surface runoff typically sheet flows over the ground surface slopes but can be concentrated by the planned site grading, landscaping, and drainage. The ensuing erosion can create sloughing and promote slope instability or the surface runoff can pond against structures and cause deeper than normal soil heave and/or seep into the crawl space. Therefore, strict control of surface runoff is necessary to provide long-term satisfactory performance of projects constructed on or near hillsides. It will be necessary to divert surface runoff around slopes and improvements, provide positive drainage away from structures, and install energy dissipaters at discharge points of concentrated runoff. This can be achieved by constructing the building pad several inches above the surrounding area and conveying the runoff into man-made drainage elements or natural swales that lead downgradient of the site.

Groundwater

We anticipate that rainwater will percolate through the porous topsoil and migrate downslope at the interface of the surface soil and bedrock and through fractures in the bedrock seep into the crawl space. Groundwater will also seep into excavations exposing the water migration zone or into hillside fills. Therefore, it will be necessary to intercept, collect and divert groundwater outside of the proposed improvements. This can be accomplished by installing perimeter foundation drains as recommended herein.

RECOMMENDATIONS

Seismic Design

Seismic design parameters presented below are based on Section 1613 titled "Earthquake Loads" of the 2013 California Building Code (CBC). Based on Table 20.3-1 of American Society of Civil Engineers (ASCE) Standard 7-10, titled "Minimum Design Loads for Buildings and Other Structures" (2010), we have determined a Site Class of D should be used for the site. Using a site latitude and longitude of 38.4228°N and 122.6919°W, respectively, and the U.S. Seismic Design Maps from the United States Geological Survey (USGS) website (http://geohazards.usgs.gov/designmaps/us/application.php), we recommend that the following seismic design criteria be used for structures at the site.

2013 CBC Seismic Criteria	
Spectral Response Parameter	**Acceleration (g)**
S_S (0.2 second period)	2.406
S_1 (1 second period)	1.001
S_{MS} (0.2 second period)	2.406
S_{M1} (1 second period)	1.501
S_{DS} (0.2 second period)	1.604
S_{D1} (1 second period)	1.001

Grading

Site Preparation

Areas to be developed should be cleared of vegetation and debris including that left by the removal of obsolete structures. Trees and shrubs that will not be part of the proposed development should be removed and their primary root systems grubbed. Cleared and grubbed material should be removed from the site and disposed of in accordance with County Health Department guidelines. We did not observe septic tanks, leach lines or underground fuel tanks during our study. Any such appurtenances found during grading should be capped and sealed and/or excavated and removed from the site, respectively, in accordance with established

guidelines and requirements of the County Health Department. Voids created during clearing should be backfilled with engineered fill as recommended herein.

Stripping

Areas to be graded should be stripped of the upper few inches of soil containing organic matter. Soil containing more than two percent by weight of organic matter should be considered organic. Actual stripping depth should be determined by a representative of the geotechnical engineer in the field at the time of stripping. The strippings should be removed from the site, or if suitable, stockpiled for re-use as topsoil in landscaping.

Excavations

Following initial site preparation, excavation should be performed as planned or recommended herein. Excavations extending below the proposed finished grade should be backfilled with suitable materials compacted to the requirements given below.

Within fill and garage slab-on-grade areas, the old fill and weak, porous, compressible, expansive surface soils should be excavated to within 6 inches of their entire depth (about ½ to 5 feet in our pits). The excavation of weak, compressible, expansive soils should also extend at least 12 inches below exterior slab and pavement subgrade (where planned excavations do not completely remove the weak soils) to allow space for the installation of the select fill blanket discussed in the conclusions section of this report. On sloping terrain 10:1 or steeper, fills should be constructed by excavating level keyways that expose undisturbed bedrock. The keyways should be at least 10 feet wide, extend at least 2 feet below the bedrock surface on the downhill side and should be sloped to drain to the rear. Keyway excavations should extend laterally to at least a 1:1 imaginary line extending down from the toe of the fill. Keyway subdrains are discussed hereinafter in “Subsurface Drainage.”

The excavation of weak, porous, compressible, expansive, surface materials should extend at least 3 feet beyond the edge of exterior slabs and pavements. The excavated materials should be stockpiled for later use as compacted fill, or removed from the site, as applicable. Excavation of hard resistant bedrock at the site may require heavy ripping and/or jack hammering. The grading contractor should review this report, become familiar with site conditions as they pertain to his operation and draw his own conclusions regarding excavation difficulty and suitable grading equipment.

At all times, temporary construction excavations should conform to the regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety or other stricter governing regulations. The stability of temporary cut slopes, such as those constructed during the installation of underground utilities, should be the responsibility of the contractor. Depending on the time of year when grading is performed, and the surface conditions exposed, temporary cut slopes may need to be excavated to 1½:1, or flatter. The tops of the temporary cut slopes should be rounded back to 2:1 in weak soil zones.

Subsurface Drainage

A subdrain should be installed at the rear of the keyways and/or where evidence of seepage is observed. The subdrain should consist of a 4-inch diameter (minimum) perforated plastic pipe

with SDR 35 or better embedded in Class 2 permeable material. The permeable material should be at least 12 inches thick and extend at least 48 inches above the bottom of the keyway (see Plate 11) and/or 12 inches above and below the seepage zone.

The depth and extent of subdrains should be determined and approved by the geotechnical engineer in the field during construction. In addition, subdrains should be installed at a minimum slope of 1 percent and should have cleanouts located at their ends and at turning points. “Sweep” type elbows and wyes should be used at all turning points and cleanouts, respectively. Subdrain outlets and riser cleanouts should be fabricated of the same material as the subdrain pipe as specified herein. Outlet and riser pipe fittings should not be perforated. A licensed land surveyor or civil engineer should provide “record drawings” depicting the locations of subdrains and cleanouts.

Fill Quality

All fill materials should be free of perishable matter and rocks or lumps over 6 inches in diameter, and must be approved by the geotechnical engineer prior to use. We judge the on-site soils generated from the upper elevations of the site where shallow bedrock was encountered are generally suitable for use as general and select fill. Materials generated from the lower elevations of the site, where expansive soils are located, will not be suitable for select fill unless stabilized with lime. Lime stabilized soils may prevent the growth of landscape vegetation due to the inherent elevated pH level of the soil. The suitability of the on-site soils for use as select fill should be verified during grading.

Select Fill

Select fill should be free of organic matter, have a low expansion potential, and conform in general to the following requirements:

SIEVE SIZE	PERCENT PASSING (by dry weight)
6 inch	100
4 inch	90 – 100
No. 200	10 – 60

Liquid Limit – 40 Percent Maximum
Plasticity Index – 15 Percent Maximum
R-value – 15 Minimum (pavement areas only)

Expansive on-site soils may be used as select fill if they are stabilized with lime. In general, imported fill, if needed, should be select. Material not conforming to these requirements may be suitable for use as import fill; however, it shall be the contractor’s responsibility to demonstrate that the proposed material will perform in an equivalent manner. The geotechnical engineer should approve imported materials prior to use as compacted fill. The grading contractor is responsible for submitting, at least 72 hours (3 days) in advance of its intended use, samples of the proposed import materials for laboratory testing and approval by the soils engineer.

Lime Stabilization

For preliminary planning purposes, we estimate that high calcium lime mixed at a minimum of 5½ percent (dry weight) will stabilize the expansive site soils. This percentage of lime needs to be verified prior to construction with engineering analysis and laboratory Atterberg Limits and/or pH testing using lime from the same source as that planned for use on the project and a sample of the soil to be treated. Laboratory test results and engineering analysis may indicate that a higher percentage of lime is required. The contractor should allow a minimum of 5 business days for the laboratory tests to be completed.

The lime stabilization should be performed in accordance with Section 24 of the Caltrans Standard Specifications except that a curing seal will not be required, provided the moisture content of the lime-stabilized material is maintained at or above optimum moisture content until it is permanently covered with subsequent construction. Lime stabilized materials are generally not suitable for reuse as general fill, select fill or backfill after compaction has taken place.

Fill Placement

The surface exposed by stripping and removal of heterogeneous fill and weak, compressible, expansive surface soils should be scarified to a depth of at least 6 inches, uniformly moisture-conditioned to near optimum and compacted to at least 90 percent of the maximum dry density of the materials as determined by ASTM Test Method D-1557. In expansive soil areas, moisture conditioning should be sufficient to completely close all shrinkage cracks for their full depth within pavement, exterior slab and building areas. If grading is performed during the dry season, the shrinkage cracks may extend to a few feet below the surface. Therefore, it may be necessary to excavate a portion of the cracked soils to obtain the proper moisture condition and degree of compaction. Approved fill material should then be spread in thin lifts, uniformly moisture-conditioned to near optimum and properly compacted. All structural fills, including those placed to establish site surface drainage, should be compacted to at least 90 percent relative compaction. Expansive soils used as fill should be moisture-conditioned to at least 4 percent above optimum. Only approved select materials should be used for fill within the upper 12 inches of garage slabs, exterior slabs and pavement subgrades. Fills placed on terrain sloping at 10:1 or steeper should be continually keyed and benched into firm, undisturbed bedrock. The benches should allow space for the placement of select fill of even thickness under settlement sensitive structural elements supported directly on the fill. An illustration of this grading technique is shown on Plate 11.

SUMMARY OF COMPACTION RECOMMENDATIONS	
Area	Compaction Recommendation (ASTM D-1557)
Preparation for areas to receive fill	After preparation in accordance with this report, compact upper 6 inches to a minimum of 90 percent relative compaction.
General fill (native or import)	Compact to a minimum of 90 percent relative compaction.
Structural fill beneath buildings, extending outward to 5' beyond building perimeter	Compact to a minimum of 90 percent relative compaction. Compact to a minimum of 95 percent where building pad transitions between bedrock and fill.
Structural fill beneath building pads that transition between bedrock and fills less than 3 feet thick	Compact to a minimum of 95 percent relative compaction.
Trenches	Compact to a minimum of 90 percent relative compaction. Compact the top 6 inches below vehicle pavement subgrade to a minimum of 95 percent relative compaction.
Retaining wall backfill	Compact to a minimum of 90 percent relative compaction, but not more than 95 percent.
Pavements, extending outward to 3' beyond edge of pavement	Compact upper 6 inches of subgrade to a minimum of 95 percent relative compaction.
Concrete flatwork and exterior slabs, extending outward to 3' beyond edge of slab	Compact subgrade to a minimum of 90 percent relative compaction. Where subject to vehicle traffic, compact upper 6 inches of subgrade to at least 95 percent relative compaction.
Aggregate Base	Compact aggregate base to at least 95 percent relative compaction.

Permanent Cut and Fill Slopes

In general, cut and fill slopes should be designed and constructed at slope gradients of 2:1 (horizontal to vertical) or flatter, unless otherwise approved by the geotechnical engineer in specified areas. In expansive soil areas cut and fill slopes should be no steeper than 3:1. Where steeper slopes are required, retaining walls should be used. Fill slopes steeper than 2:1 will require the use of geogrid to increase stability. Providing recommendations for grid type and spacing was not part of our requested and/or proposed scope of work. Should the need to use geogrid arise, additional laboratory testing and stability analyses will be required. Fill slopes should be constructed by overfilling and cutting the slope to final grade. “Track walking” of a slope to achieve slope compaction is not an acceptable procedure for slope construction. Permanent cut slopes should be observed in the field by the geotechnical engineer to verify that the exposed soil and/or bedrock conditions are as anticipated. The geotechnical engineer is not responsible for measuring the angles of these slopes. Denuded slopes should be planted with fast-growing, deep-rooted groundcover to reduce sloughing or erosion. The cut and fill slope inclinations recommended herein address only the stability of the slopes. It should not be inferred that they address the feasibility of landscaping and weed control. Where these are concerns, the slopes should be flattened accordingly.

Wet Weather Grading

Generally, grading is performed more economically during the summer months when on-site soils are usually dry of optimum moisture content. Delays should be anticipated in site grading performed during the rainy season or early spring due to excessive moisture in on-site soils. Special and relatively expensive construction procedures, including dewatering of excavations and importing granular soils, should be anticipated if grading must be completed during the winter and early spring or if localized areas of soft saturated soils are found during grading in the summer and fall.

Open excavations also tend to be more unstable during wet weather as groundwater seeps towards the exposed cut slope. Severe sloughing and occasional slope failures should be anticipated. The occurrence of these events will require extensive clean up and the installation of slope protection measures, thus delaying projects. The general contractor is responsible for the performance, maintenance and repair of temporary cut slopes.

Foundation Support

Residences located in areas underlain by expansive soils should be supported on a system of grade beams supported on drilled, cast-in-place, concrete piers that gain support below the zone of significant moisture variation and are designed to resist the uplift forces induced by the expansive soils. Where expansive soils are not present or grading has been performed to remediate expansive soil heave, the structures should be supported by spread footings that gain support in undisturbed bedrock or select fill of even thickness. Spread footings can also be used where the building pad straddles level areas excavated into firm, undisturbed bedrock and areas underlain by buttressed fills provided the fill thickness does not exceed 3 feet and the fills are compacted to at least 95 percent relative compaction. We do not recommend the use of drilled

pier foundations in areas with shallow resistant bedrock due to potentially difficult drilling conditions. Specific recommendations for each alternative are given in the following sections of the report.

Spread Footings

Spread footings should be at least 12 inches wide and should bottom on select engineered fill or on undisturbed bedrock, as applicable, at least 12 inches below lowest adjacent grade. Additional embedment or width may be needed to satisfy code and/or structural requirements. On ungraded sloping terrain, the footings should be stepped as necessary to produce level tops and bottoms. Footings should be deepened as necessary to provide at least 7 feet of horizontal confinement between the footing bottoms and the face of the nearest slope. Confinement in bedrock can be reduced to 5 feet.

The bottoms of all footing excavations should be thoroughly cleaned out or wetted and compacted using hand-operated tamping equipment prior to placing steel and concrete. This will remove the soils disturbed during footing excavations, or restore their adequate bearing capacity, and reduce post-construction settlements. Footing excavations should not be allowed to dry before placing concrete. If shrinkage cracks appear in soils exposed in the footing excavations, the soil should be thoroughly moistened to close all cracks prior to concrete placement. The moisture condition of the foundation excavations should be checked by the geotechnical engineer no more than 24 hours prior to placing concrete.

Bearing Pressures - Footings installed in accordance with these recommendations may be designed using allowable bearing pressures of 2000, 3000 and 4000 pounds per square foot (psf), for dead loads, dead plus code live loads, and total loads (including wind and seismic), respectively. For footings bottomed entirely on bedrock, the above pressures can be increased to 3000, 3500 and 6000 psf.

Lateral Pressures - The portion of spread footing foundations extending into undisturbed bedrock or select engineered fill may impose a passive equivalent fluid pressure and a friction factor of 350 pcf and 0.35, respectively, to resist sliding. Passive pressure should be neglected within the upper 6 inches, unless the soils are confined by concrete slabs or pavements.

Drilled Piers

Skin Friction - The portion of the piers extending below the layer of seasonal moisture variation (3 feet) may be designed using an allowable skin friction of 600 psf for dead load plus long term live loads. This value can be increased by ⅓ for total loads, including downward vertical wind or seismic forces. A skin friction value of 400 psf should be used to resist uplift forces. End bearing should be neglected because of the difficulty of cleaning out small diameter pier holes, and the uncertainty of mobilizing end bearing and skin friction simultaneously.

Lateral Forces - Lateral loads on piers will be resisted by passive pressure on the soil and bedrock. An equivalent fluid pressure of 350 pcf acting on 2 pier diameters should be used. Confinement for passive pressure may be assumed from 3 feet below the lowest adjacent finished ground surface.

The piers should be interconnected with grade beams to support building loads and to redistribute stresses imposed by wind or earthquakes and the expansive surface soils. The grade beams should be designed to span between the piers in accordance with structural requirements. The steel from the piers should extend sufficient distance into the grade beams to develop its full bond strength.

Uplift Forces - The piers and grade beams should be designed to resist uplift pressures imposed by expansive soils. The uplift pressure should be assumed to be 2,000 psf of grade beam surface contact.

Pier Drilling - We did not encounter groundwater and/or caving-prone soils within the planned pier depth during our study. If groundwater is encountered during drilling, it may be necessary to de-water the holes and/or place the concrete by the tremie method. If caving soils are encountered, it may be necessary to case the holes. Difficult drilling may be required to achieve the required penetration. The drilling subcontractor should review this report, become familiar with site conditions as they pertain to his operation and draw his own conclusions regarding drilling difficulty, suitable drill rigs and the need for casing and dewatering prior to bidding.

Concrete - Concrete mix design and placement should be done in accordance with the current ADSC and/or ACI specifications. Concrete should not be allowed to mushroom at the top of the piers or below the bottom of grade beams.

Retaining Walls

Retaining walls constructed at the site must be designed to resist lateral earth pressures plus additional lateral pressures that may be caused by surcharge loads applied at the ground surface behind the walls. Retaining walls free to rotate (yielding greater than 0.1 percent of the wall height at the top of the backfill) should be designed for active lateral earth pressures. If walls are restrained by rigid elements to prevent rotation, they should be designed for “at rest” lateral earth pressures.

Retaining walls should be designed to resist the following earth equivalent fluid pressures (triangular distribution):

EARTH EQUIVALENT FLUID PRESSURES		
Loading Condition	**Pressure (pcf)**	**Additional Seismic Pressure (pcf)***
Active - Level Backfill	38	18
Active - Sloping Backfill 3:1 or Flatter	49	44
At Rest - Level Backfill	59	47

* If required

These pressures do not consider additional loads resulting from adjacent foundations or other loads. If these additional surcharge loadings are anticipated, we can assist in evaluating their effects. Where retaining wall backfill is subject to vehicular traffic, the walls should be designed to resist an additional surcharge pressure equivalent to two feet of additional backfill.

Retaining walls will yield slightly during backfilling. Therefore, walls should be backfilled prior to building on, or adjacent to, the walls. Backfill against retaining walls should be compacted to at least 90 and not more than 95 percent relative compaction. Over-compaction or the use of large compaction equipment should be avoided because increased compactive effort can result in lateral pressures higher than those recommended above.

Foundation Support

Retaining walls should be supported on spread footings or drilled piers, as applicable, designed in accordance with the recommendations presented in this report. Retaining wall foundations should be designed by the project civil or structural engineer to resist the lateral forces set forth in this section.

Wall Drainage and Backfill

Retaining walls should be backdrained as shown on Plate 12, Appendix A. The backdrains should consist of 4-inch diameter, rigid perforated pipe embedded in Class 2 permeable material. The pipe should be PVC Schedule 40 or ABS with SDR 35 or better, and the pipe should be sloped to drain to outlets by gravity. The top of the pipe should be at least 8 inches below lowest adjacent grade. The Class 2 permeable material should extend to within 1½ feet of the surface. The upper 1½ feet should be backfilled with compacted soil to exclude surface water. Expansive soils should not be used for wall backfill. Where expansive soils are present in the excavation made to install the retaining wall, the excavation should be sloped back 1:1 from the back of the footing or grade beam. The ground surface behind retaining walls should be sloped to drain. Where migration of moisture through retaining walls would be detrimental, retaining walls should be waterproofed.

Slab-On-Grade

Slab-on-grade subgrade should be rolled to produce a dense, uniform surface. The future expansion potential of the subgrade soils should be reduced by thoroughly presoaking the slab subgrade prior to concrete placement. The moisture condition of the subgrade soils should be checked by the geotechnical engineer no more than 24 hours prior to placing the capillary moisture break. The slabs should be underlain with a capillary moisture break consisting of at least 4 inches of clean, free-draining crushed rock or gravel (excluding pea gravel) at least ¼-inch and no larger than ¾-inch in size. Interior slabs subject to vehicular traffic may be underlain by Class 2 aggregate base. The use of Class 2 aggregate base should be reviewed on a case by case basis. Class 2 aggregate base can be used for slab rock under exterior slabs.

Slabs should be designed by the project civil or structural engineer to support the anticipated loads, reduce cracking and provide protection against the infiltration of moisture vapor. Garage slabs should be separated from foundations and framing elements with low friction material.

A vapor barrier should be placed under all slabs-on-grade that are likely to receive an impermeable floor finish or be used for any purpose where the passage of water vapor through the floor is undesirable. RGH does not practice in the field of moisture vapor transmission evaluation or mitigation. Therefore, we recommend that a qualified person be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. This person should provide recommendations for mitigation of the potential adverse impact of moisture vapor transmission on various components of the structure as deemed appropriate.

Utility Trenches

The shoring and safety of trench excavations is solely the responsibility of the contractor. Attention is drawn to the State of California Safety Orders dealing with “Excavations and Trenches.”

Unless otherwise specified by the City of Santa Rosa, on-site, inorganic soil may be used as (general) utility trench backfill. Where utility trenches support pavements, slabs and foundations, trench backfill should consist of aggregate baserock. The baserock should comply with the minimum requirements in Caltrans Standard Specifications, Section 26 for Class 2 Aggregate Base. Trench backfill should be moisture-conditioned as necessary, and placed in horizontal layers not exceeding 8 inches in thickness, before compaction. Each layer should be compacted to at least 90 percent relative compaction as determined by ASTM Test Method D-1557. The top 6 inches of trench backfill below vehicle pavement subgrades should be moisture-conditioned as necessary and compacted to at least 95 percent relative compaction. Jetting or ponding of trench backfill to aid in achieving the recommended degree of compaction should not be attempted.

Pavements

An R-value of 15 was measured on a bulk sample of near-surface soil obtained near test pit TP-6. Provided the site grading is performed to remediate expansive soil heave, as recommended herein, the uppermost 12-inches of pavement subgrade soils will be either imported or onsite select fill with a minimum R-value of 15, or lime stabilized site soils that generally have an R-value of at least 50. Based on those R-values we recommend the pavement sections listed in the tables below be used.

PAVEMENT SECTIONS WITH SELECT FILL SUBGRADE			
TI	ASPHALT CONCRETE (feet)	CLASS 2 AGGREGATE BASE (feet)	SELECT FILL* (feet)
7.0	0.35	1.25	1.0
6.0	0.25	1.15	1.0
5.0	0.20	0.95	1.0

* R-value ≥ 15

PAVEMENT SECTIONS WITH LIME STABILIZED SELECT FILL SUBGRADE			
TI	ASPHALT CONCRETE (feet)	CLASS 2 AGGREGATE BASE (feet)	LIME STABILIZED SELECT FILL* (feet)
7.0	0.35	0.50	1.0
6.0	0.30	0.50	1.0
5.0	0.20	0.50	1.0

* R-value ≥ 50

Pavement thicknesses were computed using Caltrans CalFP v1.1 design software and are based on a pavement life of 20 years. These recommendations are intended to provide support for traffic represented by the indicated Traffic Indices. They are not intended to provide pavement sections for heavy concentrated construction storage or wheel loads such as forklifts, parked truck-trailers and concrete trucks.

Because of the very high expansion potential of the soil at the site and the difficulty in controlling seasonal moisture variation beneath and adjacent to the roadway, significant cracking may develop in the pavement even if 12-inches of select fill is installed. Increasing the thickness of select fill or installing moisture cutoffs may reduce but not eliminate the potential for cracks to develop. It should be understood that pavements will likely require regular maintenance including crack sealing and the aesthetics may not be desirable.

In areas where heavy construction storage and wheel loads are anticipated, the pavements should be designed to support these loads. Support could be provided by increasing pavement sections or by providing reinforced concrete slabs. Alternatively, paving can be deferred until heavy construction storage and wheel loads are no longer present.

Prior to placement of aggregate base, the upper 6 inches of the pavement subgrade soils (excluding lime stabilized soils) should be scarified, uniformly moisture-conditioned to near optimum, and compacted to at least 95 percent relative compaction to form a firm, non-yielding surface. Lime stabilized select fill subgrade soils should be compacted as specified in Section 24 of the Caltrans Standard Specifications.

Aggregate base materials should be spread in thin layers, uniformly moisture-conditioned, and compacted to at least 95 percent relative compaction to form a firm, non-yielding surface. The materials and methods used should conform to the requirements of the City of Santa Rosa and the current edition of the Caltrans Standard Specifications, except that compaction requirements should be based on ASTM Test Method D-1557. Aggregate used for the base course should comply with the minimum requirements specified in Caltrans Standard Specifications, Section 26 for Class 2 Aggregate Base.

Wet Weather Paving

In general, the pavements should be constructed during the dry season to avoid the saturation of the subgrade and base materials, which often occurs during the wet winter months. If

pavements are constructed during the winter, a cost increase relative to drier weather construction should be anticipated. Unstable areas may have to be overexcavated to remove soft soils. The excavations will probably require backfilling with imported crushed (ballast) rock. The geotechnical engineer should be consulted for recommendations at the time of construction.

Geotechnical Drainage

This section presents recommendations for surface and subsurface drainage. For the discussion of subsurface drainage related to grading, especially on hillsides, refer to the "Subsurface Drainage" section.

Surface

Surface water should be diverted away from slopes, foundations and edges of pavements. Surface drainage gradients should slope away from building foundations in accordance with the requirements of the CBC or local governing agency. Where a gradient flatter than 2 percent for paved areas and 4 percent for unpaved areas is required to satisfy design constraints, area drains should be installed within the rear and side yard swales with a spacing no greater than about 20 feet. Roofs should be provided with gutters and the downspouts should empty onto splash blocks that discharge directly onto paved areas or be connected to closed glued Schedule 40 PVC or ABS with SDR of 35 or better conduits discharging well away from foundations, onto paved areas (or) erosion resistant natural drainages or into the site's surface drainage system. Roof downspouts and surface drains must be maintained entirely separate from the slab underdrains recommended hereinafter.

Water seepage or the spread of extensive root systems into the soil subgrade of footings, slabs or pavements could cause differential movements and consequent distress in these structural elements. Landscaping should be planned with consideration for these potential problems.

Perimeter Foundation Drains

Where interior crawl spaces are lower than adjacent exterior grade, subdrains should be installed adjacent to perimeter foundations, except on the downhill side, to prevent surface runoff from entering the crawl space. Foundation drains should consist of trenches that are at least 10 inches below the crawl space surface and are sloped to drain by gravity. Four-inch diameter perforated pipe sloped to drain to outlets by gravity should be placed in the bottom of the trenches. The top of subdrain pipes should be at least 6 inches lower than the adjacent crawl space. The perimeter subdrain trenches should be backfilled to within 6 inches of the surface with Class 2 permeable material. The upper 6 inches should be backfilled with compacted soil to exclude surface water. An illustration of this system is shown on Plate 13. Where perimeter foundation drains are not used, water ponding in the crawl space should be anticipated. Where retaining walls are used for perimeter foundations, retaining wall backdrains may be used in lieu of foundation drains.

Crawl Space Drains

Crawl spaces are inherently damp and humid. In addition, groundwater seepage is unpredictable and difficult to control and, regardless of the care used in installing perimeter foundation drains, can find its way into crawl spaces. The ground surface within the crawl space should be sloped to drain away from foundations and toward a 12 inch square drain trench that is excavated through the longitudinal axis of the crawl space. A 4-inch diameter perforated drain pipe (SDR 35 or better) should be embedded in Class 2 permeable materials near the bottom of the trench. The drain rock should extend to the surface of the crawl space (see Plate 13). Piped outlets should be provided to allow drainage of the collected water through foundations and discharge into the storm drain system. Additional protection against water seepage into crawl spaces can be obtained by compacting fill placed adjacent to perimeter walls to at least 90 percent relative compaction.

Maintenance

Periodic land maintenance, especially on hillsides, will be required. Surface and subsurface drainage facilities should be checked frequently, and cleaned and maintained as necessary or at least annually. A dense growth of deep-rooted ground cover must be maintained on all slopes to reduce sloughing and erosion. Sloughing and erosion that occurs must be repaired promptly before it can enlarge.

Supplemental Services

Pre-Bid Meeting

It has been our experience that contractors bidding on the project often contact us to discuss the geotechnical aspects. Informal contacts between RGH and an individual contractor could result in incomplete or misinterpreted information being provided to the contractor. Therefore, we recommend a pre-bid meeting be held to answer any questions about the report prior to submittal of bids. If this is not possible, questions or clarifications regarding this report should be directed to the project owner or their designated representative. After consultation with RGH, the project owner or their representative should provide clarifications or additional information to all contractors bidding the job.

Plan and Specifications Review

Coordination between the design team and the geotechnical engineer is recommended to assure that the design is compatible with the soil, geologic and groundwater conditions encountered during our study. RGH Consultants (RGH) recommends that we be retained to review the project plans and specifications to determine if they are consistent with our recommendations. In the event we are not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations.

Construction Observation and Testing

Prior to construction, a meeting should be held at the site that includes, but is not limited to, the owner or owner's representative, the general contractor, the grading contractor, the foundation contractor, the underground contractor, any specialty contractors, the project civil engineer, other members of the project design team and RGH. This meeting should serve as a time to discuss and answer questions regarding the recommendations presented herein and to establish the coordination procedure between the contractors and RGH.

In addition, we should be retained to monitor all soils related work during construction, including:

- Site stripping, over-excavation, grading, and compaction of near surface soils;
- Placement of all engineered fill and trench backfill with verification field and laboratory testing;
- Observation of all foundation excavations; and
- Observation of foundation and subdrain installations.

If, during construction, we observe subsurface conditions different from those encountered during the explorations, we should be allowed to amend our recommendations accordingly. If different conditions are observed by others, or appear to be present beneath excavations, RGH should be advised at once so that these conditions may be evaluated and our recommendations reviewed and updated, if warranted. The validity of recommendations made in this report is contingent upon our being notified and retained to review the changed conditions.

If more than 18 months have elapsed between the submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at, or adjacent to, the site, the recommendations made in this report may no longer be valid or appropriate. In such case, we recommend that we be retained to review this report and verify the applicability of the conclusions and recommendations or modify the same considering the time lapsed or changed conditions. The validity of recommendations made in this report is contingent upon such review.

These supplemental services are performed on an as-requested basis and are in addition to this geotechnical study. We cannot accept responsibility for items that we are not notified to observe or for changed conditions we are not allowed to review.

LIMITATIONS

This report has been prepared by RGH for the exclusive use of Taylor Mountain Inc. and their consultants as an aid in the design and construction of the proposed subdivision described in this report.

The validity of the recommendations contained in this report depends upon an adequate testing and monitoring program during the construction phase. Unless the construction monitoring and testing program is provided by our firm, we will not be held responsible for compliance with design recommendations presented in this report and other addendum submitted as part of this report.

Our services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no warranty, either expressed or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed construction, the results of our field exploration, laboratory testing program, and professional judgment. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observation of construction.

The test pits represent subsurface conditions at the locations and on the date indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. Site conditions and cultural features described in the text of this report are those existing at the time of our field exploration on October 16, 2015, and may not necessarily be the same or comparable at other times.

It should be understood that slope failures including landslides, debris flows and erosion are on-going natural processes which gradually wear away the landscape. Residual soils and weathered bedrock can be susceptible to downslope movement, even on apparently stable sites. Such inherent hillside and slope risks are generally more prevalent during periods of intense and prolonged rainfall, which occasionally occur, in northern California and/or during earthquakes. Therefore, it must be accepted that occasional, unpredictable slope failure and erosion and deposition of the residual soils and weathered bedrock materials are irreducible risks and hazards of building upon or near the base of any hillside or any steeper slope area throughout northern California. By accepting this report, the client and other recipients acknowledge their understanding and acceptance of these risks and hazards, and the terms and conditions herein.

The scope of our services did not include an environmental assessment or a study of the presence or absence of toxic mold and/or hazardous, toxic or corrosive materials in the soil, surface water, groundwater or air (on, below or around this site), nor did it include an evaluation or study for the presence or absence of wetlands. These studies should be conducted under separate cover, scope and fee and should be provided by a qualified expert in those fields.

APPENDIX A - PLATES

LIST OF PLATES

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Plate 11	Hillside Grading Illustration
Plate 12	Retaining Wall Backdrain Illustration
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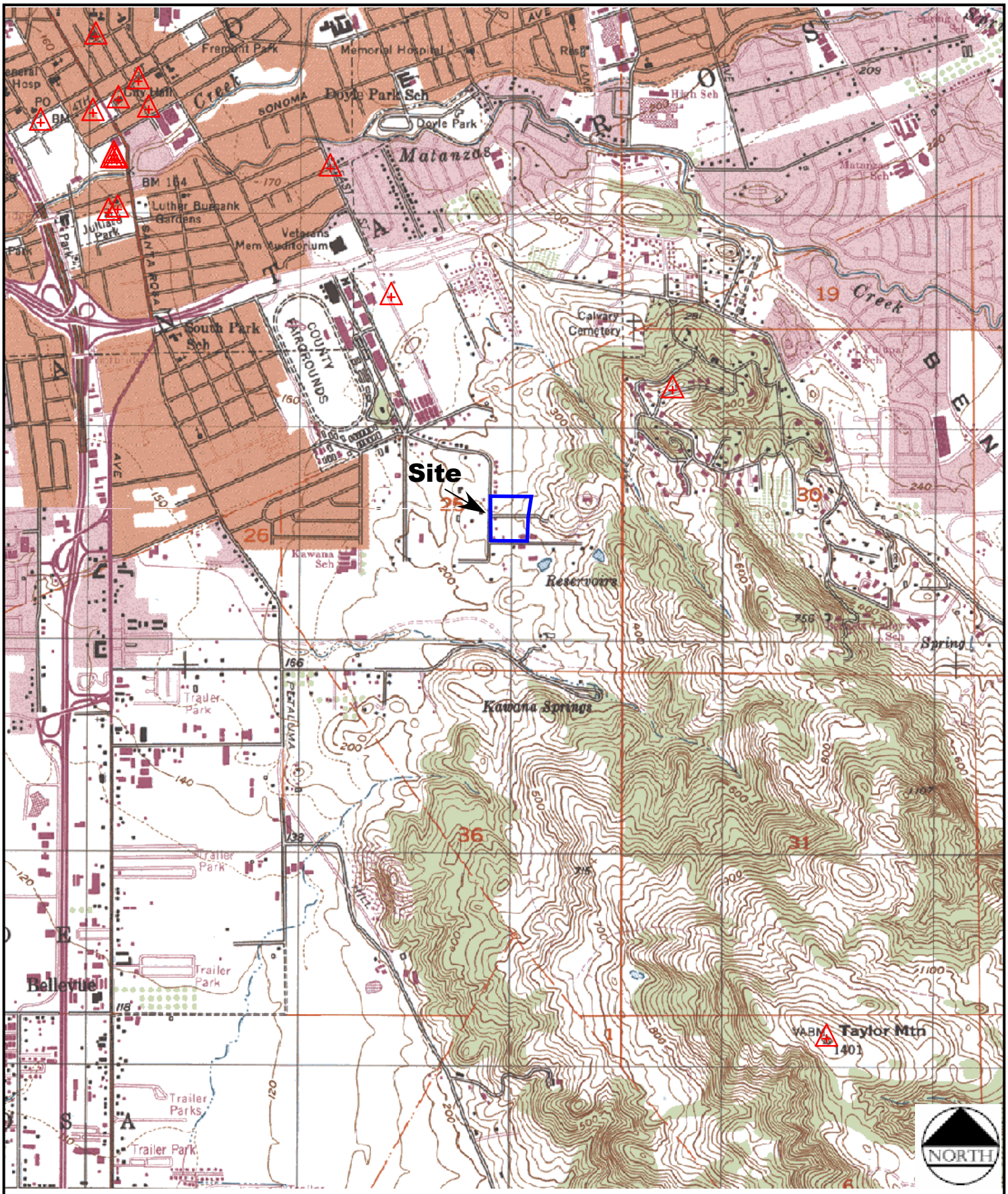


Reference: Maptech Topoquad, Sant Rosa, California Quadrangle

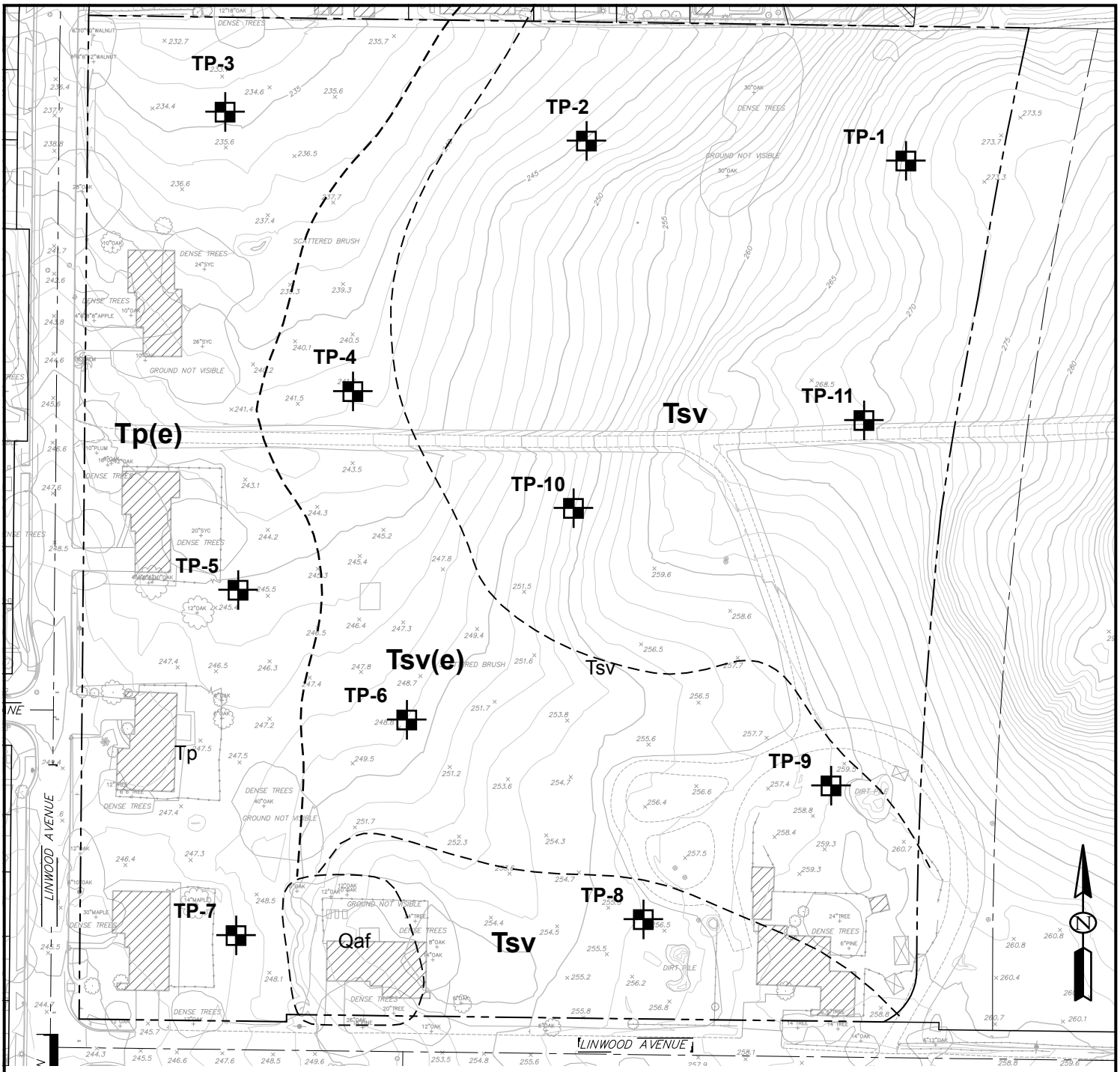
Scale: 1" = 2000'

RGH CONSULTANTS

Job No: 5027.09.04.1 | Date: NOV 2015

SITE LOCATION MAP
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
1



100 0 100 feet

Scale: 1" = 100'

EXPLANATION

TP-16 Test Pit Location and Number

Geologic Contact Dashed Where Approximate, Dotted Where Concealed, Queried Where Unknown

Qaf Artificial Fill

Tp(e) Petaluma Formation with Expansive Surface Soils

Tsv(e) Sonoma Volcanics with Expansive Surface Soils

Tsv Sonoma Volcanics without Expansive Surface Soils

Reference: Topographic Map of McIntosh Properties, Carlile Macy, October 2015, sheet 1 of 1

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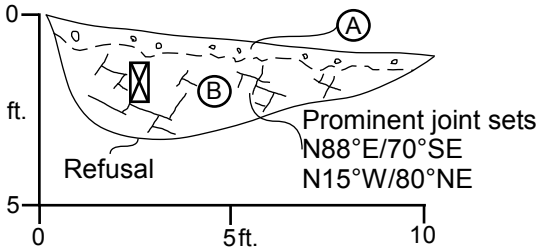
EXPLORATION PLAN AND GEOLOGIC MAP

McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE 2

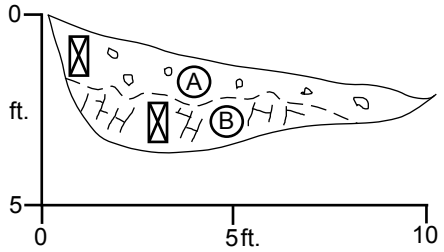
TP-1
N85°W



Ⓐ RED-BROWN SANDY CLAY WITH GRAVEL (CL), moderately stiff, dry, fine to coarse sand, fine to coarse angular gravel, porous.

Ⓑ LIGHT GRAY WITH RED-BROWN WEATHERING RINDS ANDESITE, closely to moderately fractured, moderately hard, moderately strong, slightly to moderately weathered, joints tight, rough, undulating, with some mineral infill.

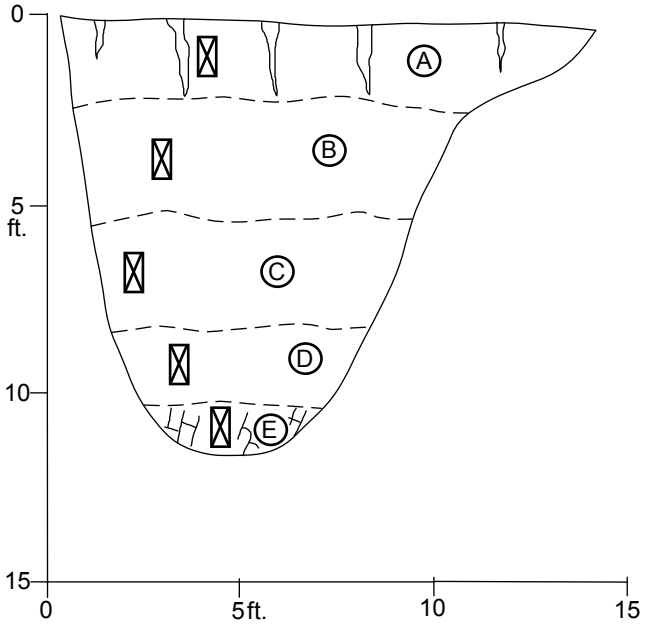
TP-2
N40°W



Ⓐ RED-BROWN SANDY CLAY WITH GRAVEL (CL), medium stiff, dry, fine to coarse sand, fine to coarse angular gravel, porous.

Ⓑ LIGHT GRAY WITH RED-BROWN WEATHERING RINDS ANDESITE AND ANDESITE TUFF, very closely spaced fractures, firm to moderately hard, weak to moderately strong, moderately weathered.

TP-3
N05°E



Ⓐ DARK GRAY CLAY (CH), hard, dry, 1 inch wide shrinkage cracks to 2 feet.

Ⓑ LIGHT OLIVE-BROWN CLAY (CL), stiff, dry to moist at 4 1/2 feet (Completely Weathered Petaluma Formation Bedrock).

Ⓒ YELLOW AND LIGHT OLIVE-BROWN CLAY (CH), moderately stiff, moist, some pressure facets and charcoal (Completely Weathered Petaluma Formation Bedrock).

Ⓓ DARK GRAY AND OLIVE CLAY (CH), moderately stiff, moist, abundant charcoal (Completely Weathered Petaluma Formation Bedrock).

Ⓔ LIGHT GRAY ANDESITE, closely spaced fractures, moderately hard, moderately strong, fresh, vesicular (Sonoma Volcanics Bedrock).

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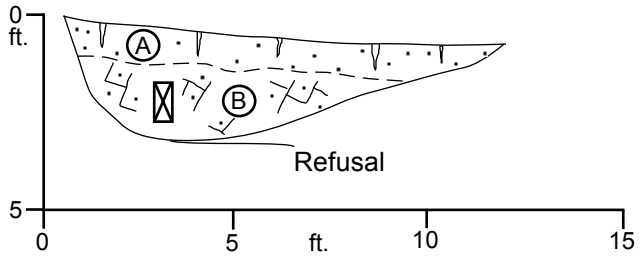
LOG OF TEST PITS TP-1 THROUGH TP-3
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
3

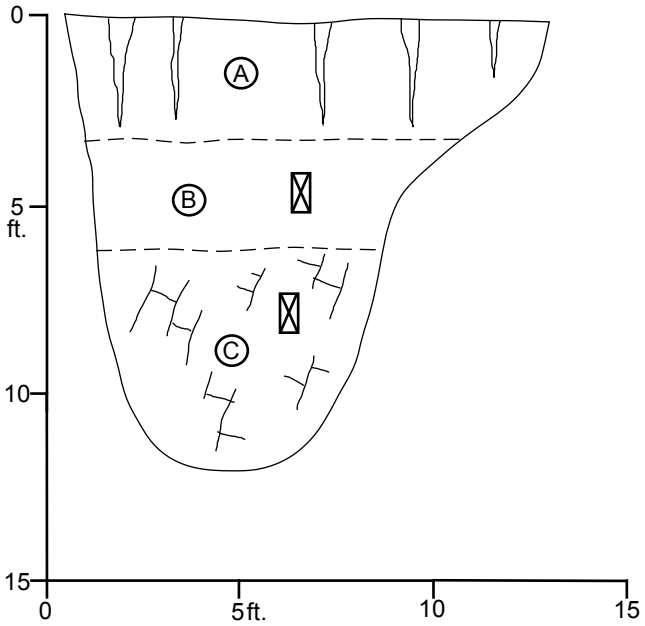
TP-4
S80°W



Ⓐ DARK BROWN CLAY WITH SAND (CH), stiff, dry, 1/2 inch wide shrinkage cracks to 1 feet.

Ⓑ BROWN AND LIGHT BROWN SANDSTONE, very closely to closely spaced fractures, moderately hard, moderately strong, slightly weathered (Sonoma Volcanics Bedrock).

TP-5
N05°W

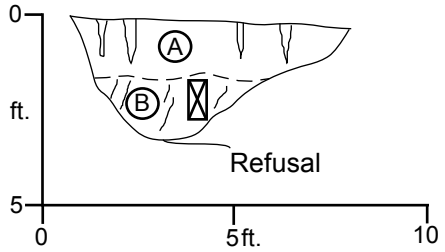


Ⓐ DARK GRAY CLAY (CH), hard, dry, 1 inch wide shrinkage cracks to 3 feet.

Ⓑ LIGHT BROWN AND YELLOW-BROWN CLAY (CL), very stiff, moist, some pressure facets (Completely Weathered Petaluma Formation Bedrock).

Ⓒ LIGHT OLIVE AND RED-BROWN CLAYSTONE, closely spaced fractures, firm, friable, moderately weathered (Petaluma Formation Bedrock).

TP-6
N80°W



Ⓐ DARK GRAY CLAY (CH), hard, dry, 1 inch wide shrinkage cracks to 2 feet.

Ⓑ LIGHT OLIVE AND RED-BROWN VESICULAR TUFF, closely spaced fractures, firm to moderately hard, weak to moderately strong, moderately weathered.

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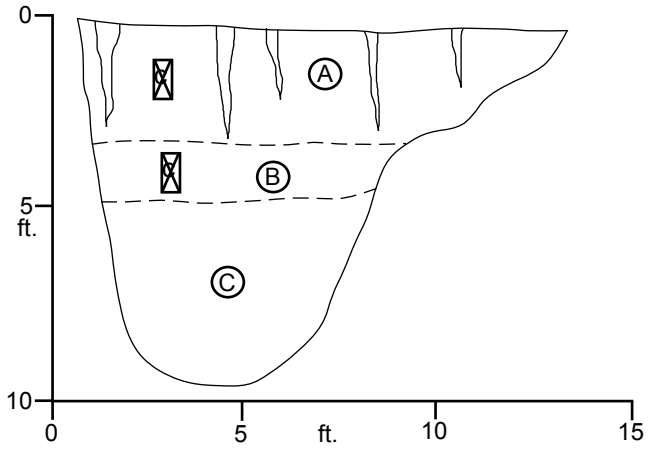
LOG OF TEST PITS TP-4 THROUGH TP-6
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
4

TP-7
N10°E

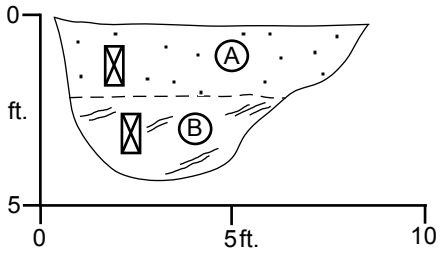


Ⓐ DARK GRAY CLAY (CH), hard, dry, shrinkage cracks, to 3 feet.

Ⓑ OLIVE CLAY (CL-CH), very stiff, dry, some $CaCO_3$ concretions (Completely Weathered Petaluma Formation Bedrock).

Ⓒ LIGHT BROWN AND YELLOW-BROWN CLAY (CL), very stiff, moist, some pressure facets (Completely Weathered Petaluma Formation Bedrock).

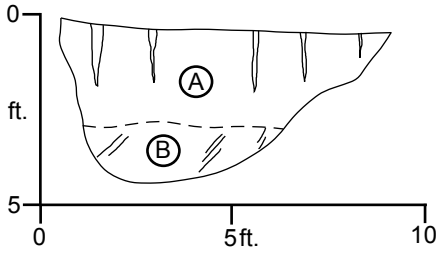
TP-8
S80°W



Ⓐ RED-BROWN CLAY WITH SAND (CL), stiff, dry, fine to medium sand, porous.

Ⓑ RED-BROWN, OLIVE AND DARK GRAY SANDY TUFF, very closely spaced fractures, firm to moderately hard, weak to moderately strong, moderately weathered (Sonoma Volcanics Bedrock).

TP-9
S75°W



Ⓐ DARK GRAY CLAY (CH), hard, dry, shrinkage cracks to 2 1/2 feet.

Ⓑ GRAY AND RED-BROWN ANDESITE, very closely spaced fractures, moderately hard, moderately strong, slightly weathered (Sonoma Volcanics Bedrock).

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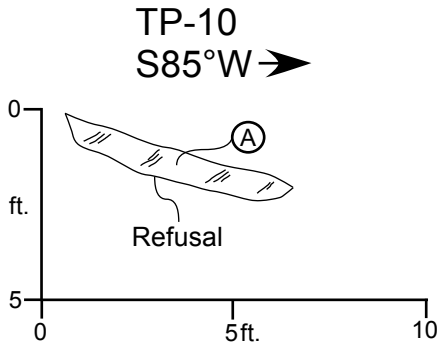
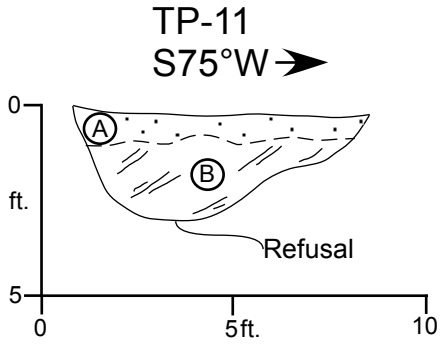
LOG OF TEST PITS TP-7 THROUGH TP-9
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
5



Ⓐ LIGHT GRAY AND RED BROWN ANDESITE, closely spaced fractures, hard, strong, slightly weathered.



Ⓐ RED-BROWN SANDY CLAY (CL), stiff, dry, fine to coarse sand, porous.

Ⓑ LIGHT GRAY AND RED-BROWN ANDESITE, very closely spaced fractures, hard, strong, slightly weathered.

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LOG OF TEST PITS TP-10 THROUGH TP-11

McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE

6

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL (LITTLE OR FINES)		GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVEL WITH FINES (OVER 12% OF FINES)		GM	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GC	CLAYEY GRAVEL, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SAND, GRAVELLY SAND, LITTLE OR NO FINES
				SP	POORLY-GRADED SAND, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (OVER 12% OF FINES)		SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
				SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANICS SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	ORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS AND OTHER SOILS WITH HIGH ORGANIC-CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

Consol - Consolidation
Gs - Specific Gravity
SA - Sieve Analysis
■ - "Undisturbed" Sample
⊠ - Bulk or Disturbed Sample
◪ - Standard Penetration Test
⧄ - Sample Attempt With No Recovery
◧ - Sample Recovered But Not Retained

Shear Strength, psf		Confining Pressure, psf	
Tx	320	(2600)	- Unconsolidated Undrained Traixial
TxCU	320	(2600)	- Consolidated Undrained Triaxial
DS	2750	(2600)	- Consolidated Drained Direct Shear
UC	2000		- Unconfined Compression
FVS	470		- Field Vane Shear
LVS	700		- Laboratory Vane Shear
SS			- Shrink Swell
EXP			- Expansion
P			- Permeability

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SOIL CLASSIFICATION AND KEY TO TEST DATA
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
7

LAYERING

MASSIVE	Greater than 6 feet
THICKLY BEDDED	2 to 6 feet
MEDIUM BEDDED	8 to 24 inches
THINLY BEDDED	2½ to 8 inches
VERY THINLY BEDDED	¾ to 2½ inches
CLOSELY LAMINATED	¼ to ¾ inches
VERY CLOSELY LAMINATED	Less than ¼ inch

JOINT, FRACTURE, OR SHEAR SPACING

VERY WIDELY SPACED	Greater than 6 feet
WIDELY SPACED	2 to 6 feet
MODERATELY SPACED	8 to 24 inches
CLOSELY SPACED	2½ to 8 inches
VERY CLOSELY SPACED	¾ to 2½ inches
EXTREMELY CLOSELY SPACED	Less than ¼ inch

HARDNESS

Soft - pliable; can be dug by hand
Firm - can be gouged deeply or carved with a pocket knife
Moderately Hard - can be readily scratched by a knife blade; scratch leaves heavy trace of dust and is readily visible after the powder has been blown away
Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible
Very Hard - cannot be scratched with pocket knife, leaves a metallic streak

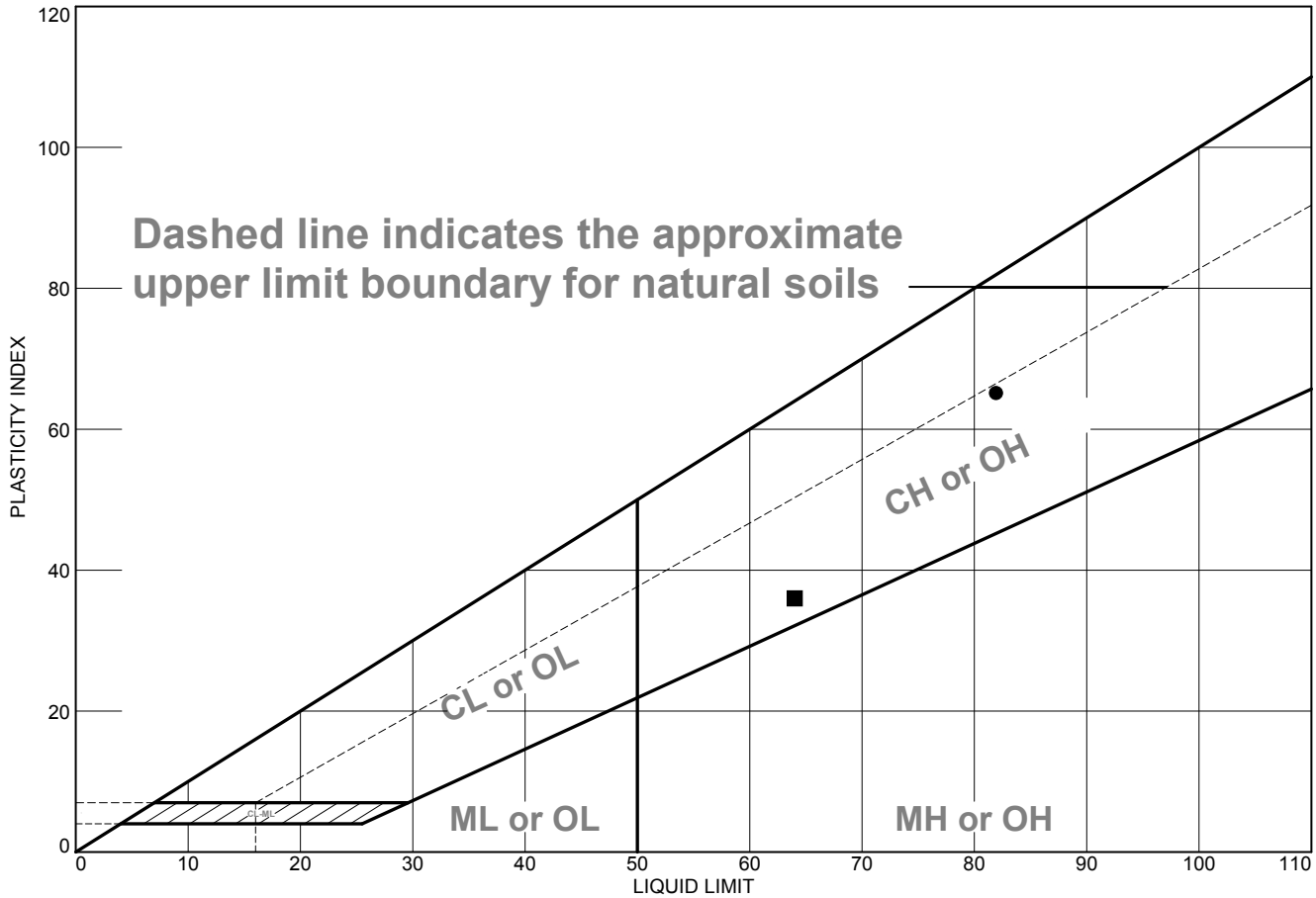
STRENGTH

Plastic - capable of being molded by hand
Friable - crumbles by rubbing with fingers
Weak - an unfractured specimen of such material will crumble under light hammer blows
Moderately Strong - specimen will withstand a few heavy hammer blows before breaking
Strong - specimen will withstand a few heavy ringing hammer blows and usually yields large fragments
Very Strong - rock will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments

DEGREE OF WEATHERING

Highly Weathered - abundant fractures coated with oxides, carbonates, sulphates, mud, etc., thorough discoloration, rock disintegration, mineral decomposition
Moderately Weathered - some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition
Slightly Weathered - a few stained fractures, slight discoloration, little or no effect on cementation, no mineral composition
Fresh - unaffected by weathering agents; no appreciable change with depth

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dk Gray Clay (CH)	82	17	65		87.2	CH
■	Brn Clayey Sand (SC)	64	28	36		33.8	SC

Project No. 5027.09.04.1 **Client:** RGH Consultants

Project: McIntosh Property Subdivision

●**Source of Sample:** TP-3 **Depth:** 0.5'-1.5'

■**Source of Sample:** TP-6 **Depth:** 1.5'-3.0' **Sample Number:** Bulk

Remarks:

●Expansion Index=189

■Expansion Index=21

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CLASSIFICATION TEST DATA

McIntosh Property Subdivision

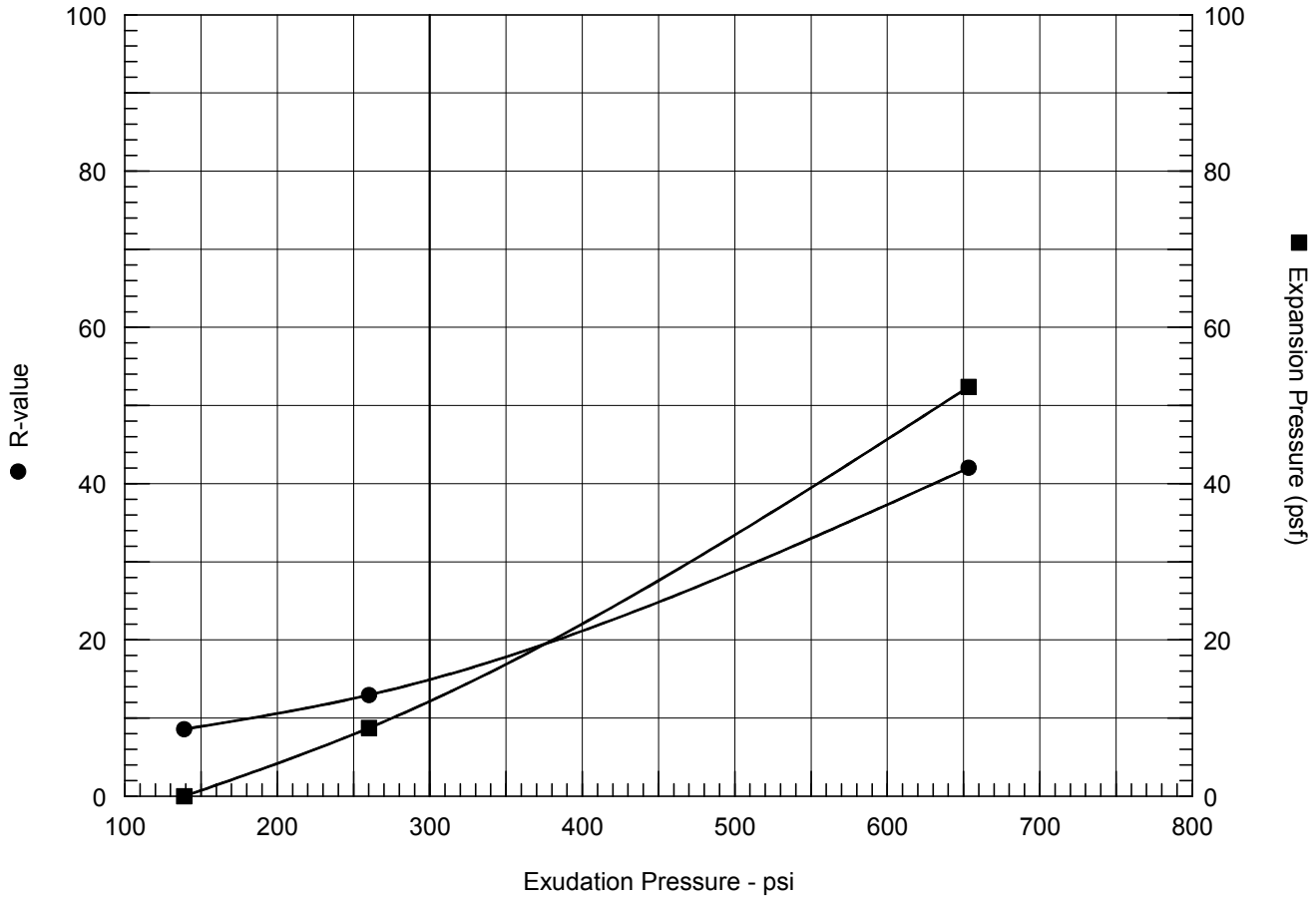
Linwood Avenue

Santa Rosa, California

PLATE

9

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	225	91.4	32.8	52	83	2.51	653	42	42
2	90	85.7	35.7	9	128	2.48	260	13	13
3	40	83.7	37.5	0	136	2.54	139	9	9

Test Results	Material Description
R-value at 300 psi exudation pressure = 15 **Exp. pressure at 300 psi exudation pressure =** 12 psf	Brn Clayey Sand (SC)
Project No.: 5027.09.04.1 **Project:** McIntosh Property Subdivision **Source of Sample:** TP-6 **Depth:** 1.5'-3.0' **Sample Number:** Bulk **Date:** 10/30/2015	**Tested by:** SEF **Checked by:** GEF **Remarks:**

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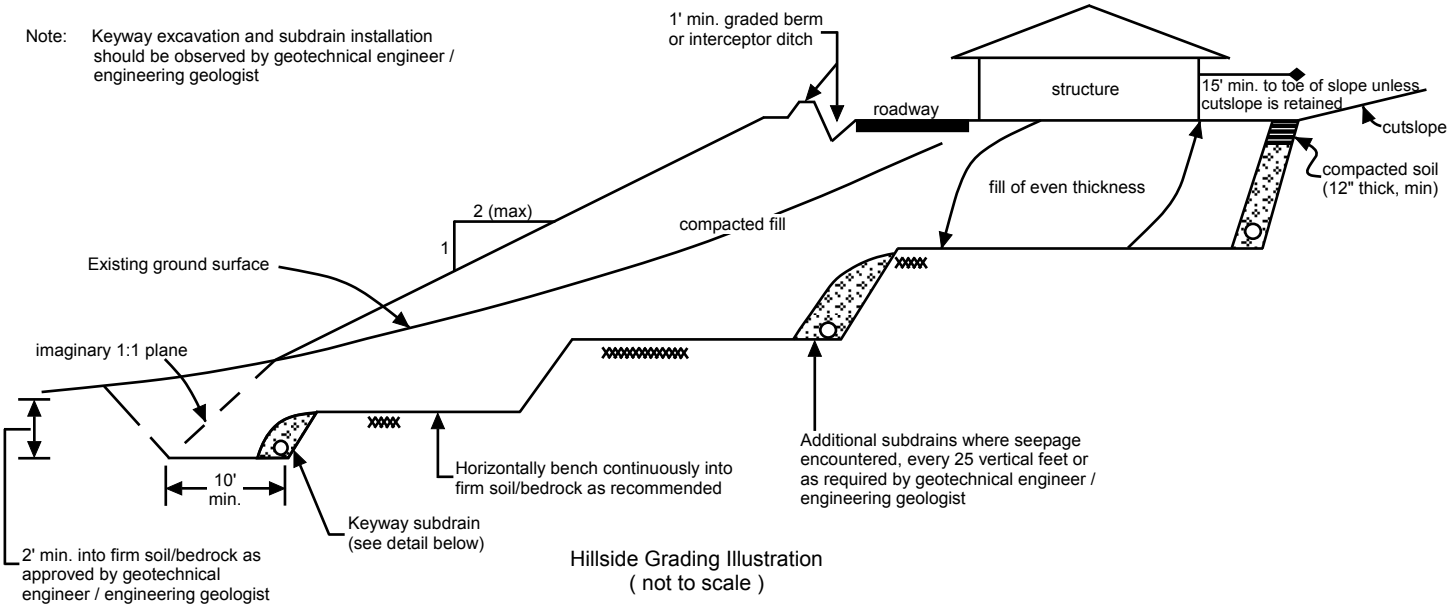
Job No: 5027.09.04.1 | Date: NOV 2015

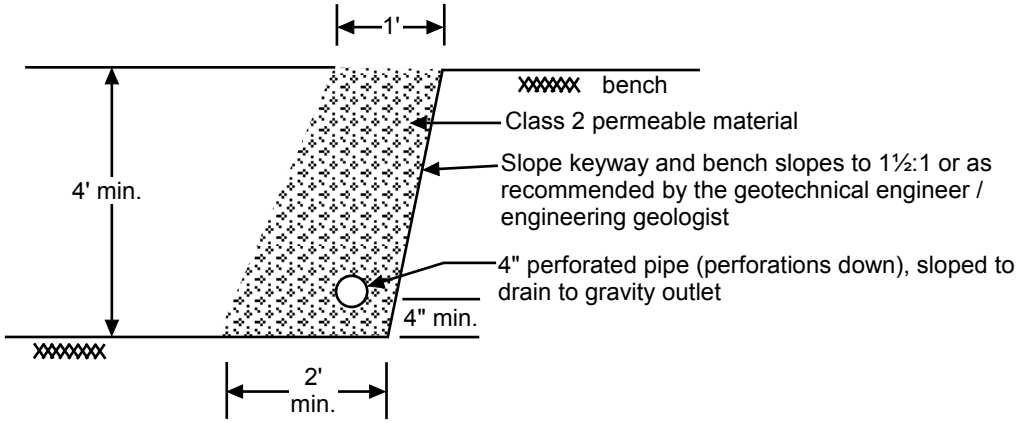
R VALUE TEST DATA
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
10

Note: Keyway excavation and subdrain installation should be observed by geotechnical engineer / engineering geologist



Hillside Grading Illustration
(not to scale)



Keyway Subdrain
(not to scale)

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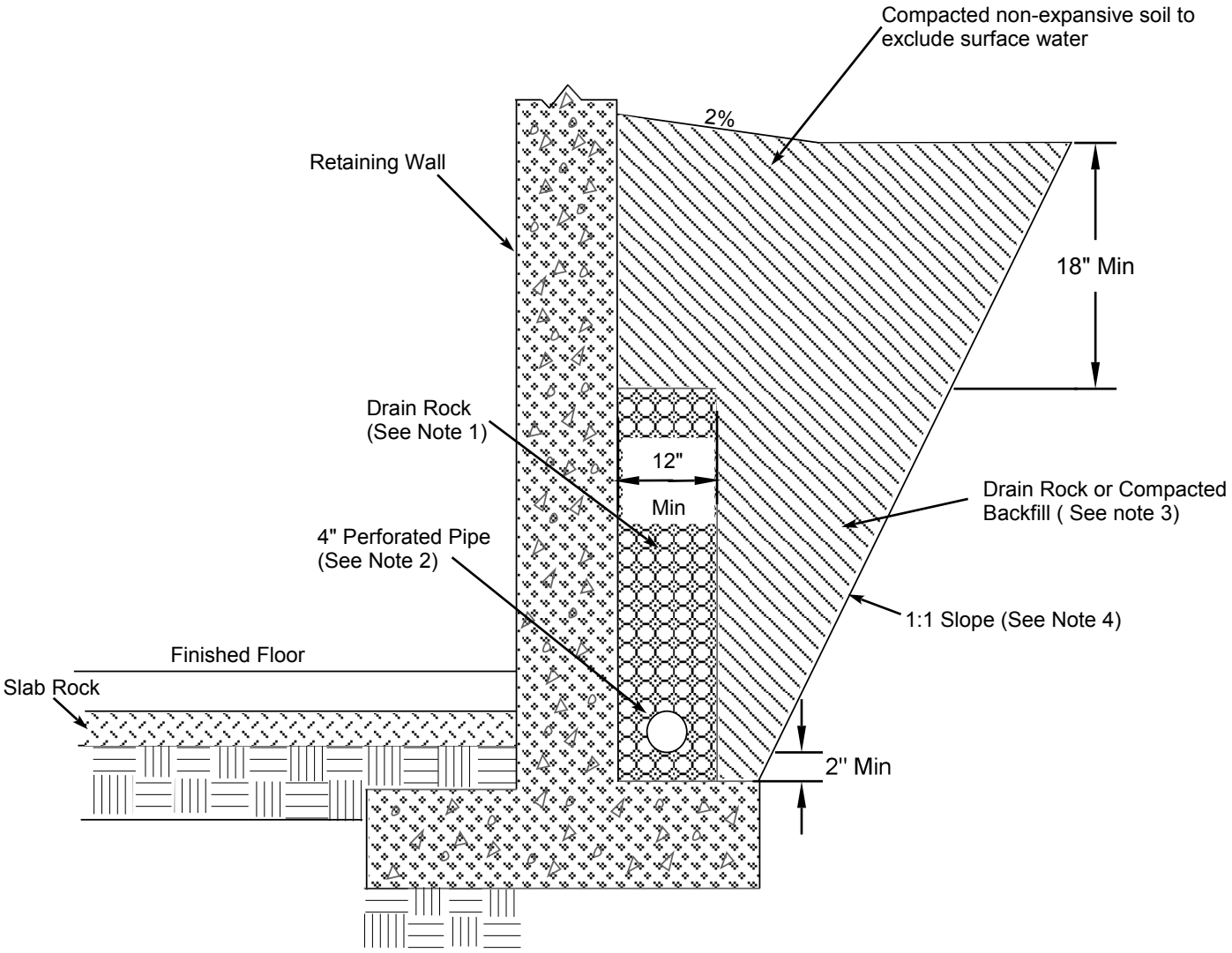
HILLSIDE GRADING ILLUSTRATION
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE
11



Notes:

1. Drain rock should meet the requirements for Class 2 Permeable Material, Section 68, State of California "Caltrans" Standard Specification, latest edition. Drain rock should be placed to approximately three-quarters the height of the retaining wall.

2. Pipe should conform to the requirements of Section 68 of State of California "Caltrans" Standards, perforations placed down, sloped at 1% for gravity flow to outlet or sump with automatic pump. The pipe invert should be located at least 8 inches below the lowest adjacent finished surface.

3. During construction the contractor should use appropriate methods such as temporary bracing and/or light compaction equipment to avoid overstressing the walls. Non-expansive soils to be used as backfill.

4. Slope excavation back at a 1:1 gradient from the back of footing where expansive materials are exposed.

Not to Scale

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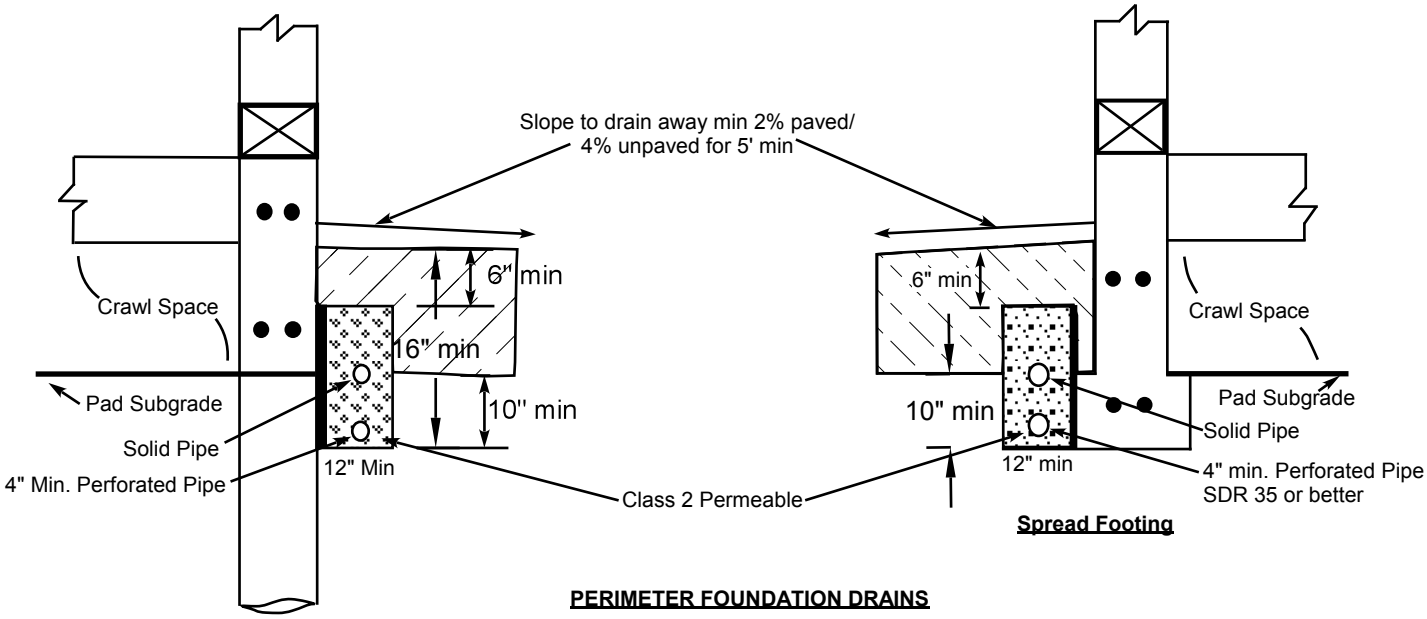
Job No: 5027.09.04.1 | Date: NOV 2015

RETAINING WALL BACKDRAIN ILLUSTRATION
McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

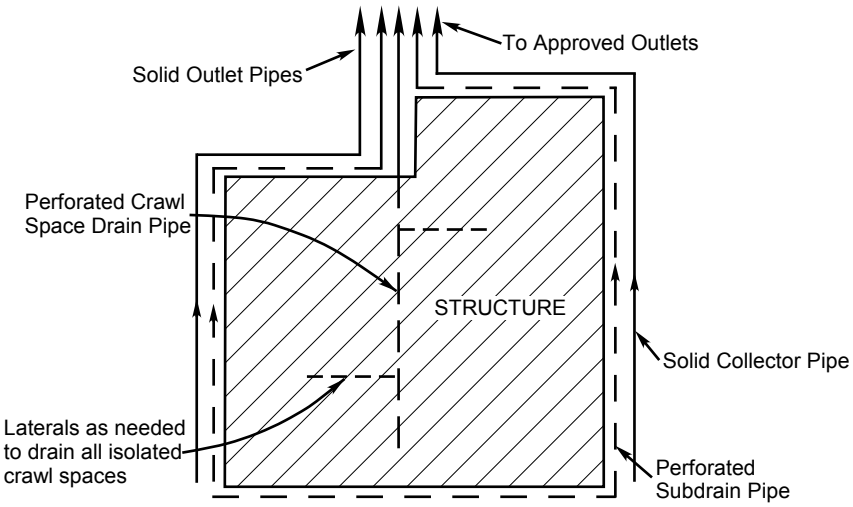
PLATE
12



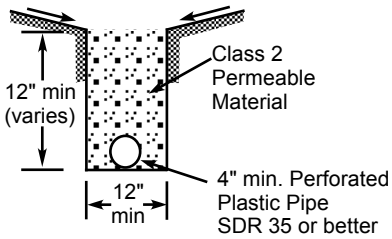
Spread Footing

PERIMETER FOUNDATION DRAINS

Pier And Grade Beam



TYPICAL FOUNDATION DRAIN PLAN



CRAWL SPACE DRAIN

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TYPICAL SUBDRAIN DETAILS

McIntosh Property Subdivision
Linwood Avenue
Santa Rosa, California

PLATE

13

APPENDIX B - REFERENCES

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APPENDIX C - DISTRIBUTION

Taylor Mountain Inc. (4, and electronic)
Attn: Aaron Matz
PO Box 6889
Santa Rosa, CA 95406
aaronmatz@yahoo.com

REP:TAW:rp:ejw

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s:\project files\5000-5250\5027\5027.09.04.1 mcintosh property subdivision\gs report.doc

ATTACHMENT G

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

Harris and Lee Environmental Sciences, LLC
April 10, 2015

Santa Rosa
(707) 571-8961 voice
(866) 873-4361 fax

San Francisco
voice (415) 287-3007
fax (866) 873-4361

Harris and Lee Environmental Sciences, LLC

All Appropriate Inquiry-
Phase 1 Environmental Site Assessment

2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

APN 044-200-027, -029 & -040

Prepared for:

APM Homes, Inc.
P.O. Box 6858
Santa Rosa, CA 95406

Prepared by:

Harris and Lee Environmental Sciences, LLC

Walter Beach, REPA 705676

Robert S. Harris, REPA 976999

April 10, 2015

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Exhibit D – Site Photographs
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Exhibit F – Environmental Data Resources Reports
Exhibit G – Regulatory Records Documentation

1.0 EXECUTIVE SUMMARY

Pursuant to the request and assignment of APM Home, Inc., Harris and Lee Environmental Sciences, LLC (HLENV) has performed a Phase 1 Environmental Site Assessment on the property identified as 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404, Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040 ("Subject Property"), which is located in the City Limits of Santa Rosa in Sonoma County, California.

The purpose of this All Appropriate Inquiry, Environmental Site Assessment Phase 1 Investigation is to provide information as to the Recognized Environmental Conditions on or near the Subject Property noted above. Recognized Environmental Conditions are defined with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. This Environmental Site Assessment follows the guidelines established by the American Society for Testing and Materials (ASTM) in the document entitled "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" and designated E1527-13. As such, this assessment is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser protection as noted in CERCLA and the California Health and Safety Code; that is the "all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice as defined at 42 U.S.C. 9601(35)(B).

The Scope of Service for this Phase I Environmental Site Assessment consists of four overall tasks:

Task I: Research and review of regulatory information
Task II: A site reconnaissance of subject and nearby property
Task III: Interviews of persons with knowledge of subject and surrounding property
Task IV: Preparation of the final Environmental Site Assessment report

Site Description and Current Use

The Subject Property is located in the City Limits of Santa Rosa in Sonoma County. It is located approximately 1.69 miles south-east of the City Center of Santa Rosa and approximately 1.25 to the east of U. S. Highway 101 off Taylor Mountain Place. The general characteristic of the property's vicinity is single family residences with undeveloped land to the east and Taylor Mountain Regional Park to the south.

The Subject Property consists of three parcels. There are five single family residences located on the parcels. Three of the single family residences are located along the western perimeter and two of the single family residences are located along the southern perimeter. The remainder of the property is undeveloped land. The parcels are approximately 10.32 acres in total area.

Adjoining Properties Use

- **North:** Single family residences
- **East:** Undeveloped land
- **South:** Single family residences
- **West:** Single family residences

Standard and Additional Environmental Records Search

The Environmental Radius Report (attached to this document as a component of Exhibit F) did not identify any sites of concern.

Physical Setting

The elevation of the Subject Property is at 253 feet above sea level with the general topographic gradient towards the west. Soils consist of well drained soils with very slow infiltration rates. The property is outside the 500-year and 100-year flood zones.

Historical and Present Use of Subject Property

The Subject Property appears to have been undeveloped land prior to the 1960's. In the 1960's five (5) single family residences were built on the western and southern perimeter of the site. The remainder of the property was undeveloped land. That usage has continued through the present.

Recognized Environmental Conditions

In the course of performing this All Appropriate Inquiry-Environmental Site Assessment, Phase 1 Investigation evidence of Recognized Environmental Conditions was not identified on the Subject Property.

- **Controlled Recognized Environmental Conditions**
  No Controlled Recognized Environmental Conditions were identified in connection with the Subject Property.

- **Vapor Encroachment Conditions**
  No Vapor Encroachment Conditions were identified in connection with the Subject Property.

Historical Recognized Environmental Conditions

No Historic Recognized Environmental Conditions were identified in connection with the Subject Property.

Activity and Use Limitations

No Activity and Use Limitations were identified in connection with the Subject Property.

De Minimis Conditions

No de minimus conditions were found for the Subject Property.

Data Gaps
No data gaps were encountered during the performance of this investigation.

Summary of Findings
- The Subject Property was undeveloped land prior to the 1960's.
- In the 1960's five (5) single family residences were built on the property along the western and southern perimeter. The remainder of the property was undeveloped land.
- There is one septic system on the property.
- There are two water wells located on the property that provide all the water to the site.
- There have never been any commercial uses at the property.

Conclusions
Harris and Lee Environmental Sciences, LLC has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527 of the property designated as Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040 with the physical address of 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404, the property. Any exceptions to, or deletions from, this practice are described in Section 2.4 of this report.

This assessment has revealed no evidence of recognized environmental conditions in connection with the property.

Opinion
Harris and Lee Environmental Sciences, LLC reminds the client that it is always prudent to maintain care in handling chemicals and any hazardous materials in any building or any property. It is pertinent to be reminded that the building / property owner is ultimately responsible for the environmental compliance that occurs in any building or on any property. Thus, if a tenant is not in compliance, the owner, who has nothing to do with the tenant's operations, can be held responsible.

Recommendations
Harris and Lee Environmental Sciences, LLC recommends that no further environmental investigation is warranted on the Subject Property given the findings of this Phase I Environmental Site Assessment.

This report is governed by the Limitations set forth in Sections 2.4 and 2.5 of this report. This Executive Summary is not to be used without the accompaniment of the entire report.

2.0 INTRODUCTION

2.1 Purpose

Pursuant to the request and assignment of APM Homes, Inc., Harris and Lee Environmental Sciences, LLC (HLENV) has performed a Phase 1 Environmental Site Assessment on the property identified as 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404, Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040, which is located in the City Limits of Santa Rosa in Sonoma County, California.

The purpose of this All Appropriate Inquiry, Environmental Site Assessment Phase 1 Investigation is to provide information as to the Recognized Environmental Conditions on or near the Subject Property noted above. Recognized Environmental Conditions are defined with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. This Environmental Site Assessment follows the guidelines established by the American Society for Testing and Materials (ASTM) in the document entitled "Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process" and designated E-1527-13. As such, this assessment is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser protection as noted in CERCLA and the California Health and Safety Code; that is the "all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice as defined at 42 U.S. C. 9601(35)(B).

2.2 Definition of Terms

This section provides definitions and descriptions of terms used in this report.

Activity and Use Limitations - legal or physical restrictions or limitations on the use of, or access to, a site or facility:(1) to reduce or eliminate potential exposure to hazardous substances or petroleum products in the soil, soil vapor, groundwater, and/or surface water on the property, or (2) to prevent activities that could interfere with the effectiveness of a response action, in order to ensure maintenance of a condition of no significant risk to public health or the environment.

Controlled Recognized Environmental Condition - a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

De Minimis Condition - a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be de minimis conditions are not recognized environmental conditions nor controlled recognized environmental conditions.

Data Gap - a lack of or inability to obtain information required by this practice despite good faith efforts by the environmental professional to gather such information. Data gaps may result from incompleteness in any of the activities required by this practice, including, but not limited to site reconnaissance (for example, an inability to conduct the site visit), and interviews (for example, an inability to interview the key site manager, regulatory officials, etc.).

Historical Recognized Environmental Condition - a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

Recognized Environmental Condition – "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions." (ASTM E1527-13)

Pursuant to the ASTM E-1527-13 Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process, Recognized Environmental Conditions <u>do not include</u> Controlled Substances, Asbestos Containing Materials, Lead-base paint, Mold, Radon or other non-CERCLA related conditions.

Vapor Encroachment Condition - the presence or likely presence of chemical vapors in the sub-surface of the Subject Property caused by the release of vapors from contaminated soil or groundwater either on or near the Subject Property. A vapor encroachment condition may be considered a recognized environmental condition or a de minimus condition.

2.3 Scope of Services

The Scope of Services for this All Appropriate Inquiry, Environmental Site Assessment Phase 1 Investigation consists of four overall tasks:

Task I: Research and review of regulatory information

Task II: A site reconnaissance of subject and nearby properties
Task III: Interviews of persons with knowledge of subject and surrounding property
Task IV: Preparation of the final Environmental Site Assessment report

The Scope of Services for this All Appropriate Inquiry, Environmental Site Assessment, Phase 1 Investigation follows the Standard Practice for Environmental Site Assessments designated as E-1527-13 of the ASTM. Accordingly, the All Appropriate Inquiry, Environmental Site Assessment, Phase 1 Investigation is targeted towards the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. As such, "all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice" as defined in 42 USC 9601(35)(B) is applied. However, an evaluation of business environmental risk associated with a parcel of commercial real estate may necessitate investigation beyond that identified in this assessment.

The Scope of Services includes observations for Recognized Environmental Conditions, as well as review of information that can be obtained from regulatory files that is reasonably ascertainable within reasonable time and cost constraints. Accordingly, it cannot be guaranteed that all files are examined or that every contingency is investigated. These limitations are in conformance with the stated guidelines of ASTM E1527-13.

The Records Review includes review of files for the Subject Property available at state, county and local offices or websites, as listed in Section 5.1 of this report. Records were reviewed for adjacent properties,a s appropriate, as required by ASTM E1527-13. In some cases the status of a site is determined from telephone interviews of staff persons of these offices.

The potential for contaminated vapor migration, as well as soil and groundwater contamination, on the Subject Property is considered during evaluation of potentially relevant releases, as required by ASTM 1527-13. Releases reported with a contaminated groundwater plume within a critical distance from the Subject site were reviewed to evaluate if the reported release could constitute a potential vapor encroachment condition to the Subject Property. The critical distance between the Subject Property and a contaminated plume is defined by ASTM E2600-10 as 30 feet for dissolved petroleum hydrocarbons, and 100 feet for free-product petroleum hydrocarbons and non-petroleum chemicals of concern.

The site reconnaissance consists of the Subject Property and the identification of nearby properties. Interviews are conducted of persons associated with the Subject Property and reasonably available at the time of the site reconnaissance, and on occasion, by telephone when such interviews are possible. The report follows the Standard Practice of ASTM E-1527-13.

The Scope of Services for this All Appropriate Inquiry, Environmental Site Assessment, Phase 1 Investigation does not include analysis of Controlled Substances (CS) or Asbestos Containing Materials (ACM). Neither does the Scope of Services include analysis of the building constituents for Lead based paint or other non-CERCLA related conditions. If there is suspicion that these substances or conditions may be present, professionals licensed to assess their presence should be contacted. Harris and Lee Environmental Sciences, LLC can assist, if requested.

2.4 Significant Assumptions

The All Appropriate Inquiry, Environmental Site Assessment, Phase 1 Investigation is intended to assess the environmental conditions of a specific parcel of commercial real estate. It is intended to constitute all appropriate inquiry for purposes of the CERCLA liability, i.e., innocent landowner, contiguous property owner or bona fide prospective purchaser limitations on CERCLA liability. This Phase 1 is intended to reflect a commercially prudent and reasonable inquiry designed to identify recognized environmental conditions in connection with a property.

2.5 Limitations and Exceptions

The Scope of Services performed to complete this All Appropriate Inquiry, Environmental Site Assessment, Phase 1 Investigation was limited in nature. While we consider work of this type to be valuable in the preliminary evaluation of potential hazardous materials or waste at the site, we also must alert the Client that this study may not reveal hazardous materials releases that have occurred. Also, the site conditions can change with time, and our assessment was not intended to predict future site conditions. Because of the limited nature of this assessment, this report is not a risk assessment and the Scope of Services does not include a determination of the extent of business environmental risk nor the public health impact of, known or suspected hazardous materials or wastes. This assessment does not address whether requirements in addition to all appropriate inquiry have been met in order to qualify for the innocent landowner, contiguous property owner or bona fide prospective purchaser limitations on liability protections under CERCLA. Furthermore, this assessment does not address requirements of state or local laws or federal laws other than the all appropriate inquiry provisions of the landowner liability protections. Client(s) are cautioned that federal, state and local laws may impose environmental assessment obligations that are beyond the scope of the all appropriate inquiry provisions of this assessment.

This service has been performed in accordance with generally accepted environmental investigation practices for similar investigations conducted at this time and in this geographic area. No other guarantees or warranties, expressed or implied are provided.

It is understood by the parties hereto that the Client who has requested this assessment will use the assessment (in addition to other information) to provide information to a

lender, investors in the property, for the purposes of refinancing or purchasing said property or to satisfy regulatory agency requirements. Consultant intends no other use or disclosure. Client agrees to hold Consultant harmless for any inverse condemnation or devaluation of said property that may result if the Consultant's report or information generated is used for other purposes. Also, this report is issued with the understanding that it is to be used only in its entirety.

2.6 User Reliance

Only APM Homes, Inc., the financing institution(s) providing financing for the purchase and/or redevelopment of the property and any pertinent regulatory agencies may rely upon this report. No other person or entity may rely upon the report without written consent of Harris and Lee Environmental Sciences, LLC.

2.7 Involved Parties

The following are the parties involved in this proposed transaction on the property identified as Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040:

- Gyven McIntosh - listed current owner
- APM Homes, Inc.- prospective buyer

3.0 SITE DESCRIPTION

3.1 Site Locations and Description

Exhibit A is a vicinity map of the general area of the Subject Property. Exhibit B presents an Assessor's Parcel Map for the Subject Property having Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040. The legal description of the Subject Property may be found in the title report, which is not included in this report.

Using the Earth's Grid System, the coordinates of the Subject Property location are:

Latitude (North):	N 38.4221000° - 38° 25' 19.56''
Longitude (West):	W 122.6922000° - 122° 41' 31.92''
Elevation:	253 feet above sea level

Table 3.1: Subject Property Information

Street Address	APN	Recorded Owner	Size (Acres)	Structure Year built Sq. ft. # of floors	Use	Zone
2842 Linwood Avenue, Santa Rosa, CA 95404	044-200-027	Gyven McIntosh	0.46	1966 1,416 ft^2 1 story	Single family residence	CSC

Street Address	APN	Recorded Owner	Size (Acres)	Structure Year built Sq. ft. # of floors	Use	Zone
2574 Linwood Avenue, Santa Rosa, CA 95404	044-200-029	Gyven McIntosh	3.00	1964 2,772 ft^2 1 story	Single family residence	CSC
2862 Linwood Avenue, Santa Rosa, CA 95404	044-200-040	Gyven McIntosh	6.89	1963 2846 ft^2 1 story	Single family residence	CSC

3.2 Site and Vicinity General Characteristics

The Subject Property is located in the City Limits of Santa Rosa in Sonoma County. It is located approximately 1.69 miles south-east of the City Center of Santa Rosa and approximately 1.25 to the east of U. S. Highway 101 off Taylor Mountain Place. The general characteristic of the property's vicinity is single family residences with undeveloped land to the east and Taylor Mountain Regional Park to the south.

The Subject Property's zoning designation is CSC. CSC stands for Commercial Shopping Center.

3.3 Current Use of the Property

Current use of the Subject Property is five single family residences and undeveloped land.

3.4 Descriptions of Current Improvements

3.4.1 Structures

The following structures are located on the Subject Property:

- Five (5) one-story, single family residences. The single family residences were built in the 1960's and are between 1,500 and 2,800 square feet in area.

3.4.2 Roads

The Subject Property is bounded Taylor Mountain Place to the west and Linden Avenue to the south. Access to the property is via driveways from Taylor Mountain Place or Linden Avenue.

3.4.3 Sewage Disposal

A septic system is in place at the property.

3.4.4 Water Supply

The Subject Property is supplied water by two on-site wells.

3.4.5 Heating and cooling systems

These systems were not inspected in the course of this assessment.

3.4.6 Utilities

Pacific Gas and Electric Company provides electricity and gas service to the Subject Property.

3.5 Current Uses of the Adjoining Properties

According to the 40 CFR 312.10, "adjoining properties are defined as any real property or properties the border of which is (are) shared in part or in whole with that of the Subject Property, or that would be shared in part or in whole with that of the Subject Property but for a street, road, or other public thoroughfare separating the properties."

- **North:** Single family residences
- **East:** Undeveloped land
- **South:** Single family residences
- **West:** Single family residences

4.0 USER PROVIDED INFORMATION

The purpose of this section is to identify general tasks that will help identify the possibility of recognized environmental conditions in connection with the Subject Property. The general tasks are 1) Searches for Environmental Liens; 2) Valuation Reduction for Environmental Issues; and 3) Assessments of Specialized Knowledge. These tasks do not require technical expertise and Environmental Professionals do not normally perform these tasks. These tasks are the responsibility of the client. However, the results of these tasks must be made available for the Environmental Professionals to review; if none are provided they will be identified as "data gaps". The Environmental Professional(s) are required to review these items in order to formulate an opinion regarding the obviousness of the presence or likely presence of contamination at the property or identify them as missing "data gaps."

4.1 Searches for Environmental Liens

Searches for environmental cleanup liens against the Subject Property that are filed or recorded under federal, tribal, state or local law as required under 40 CFR Part 312 Section 312.25.

40 CFR Part 312 Section 312.25(b) states: "All information collected regarding the existence of such environmental cleanup liens associated with the property must be provided to the environmental professional."

Preliminary Title Report
First American Title Company, 400 E Street, Santa Rosa, California, provided a contemporary preliminary title report. The report Order Number is 4909-4869162 and is dated March 11, 2015.

The preliminary title report did not identify any environmental liens in connection with the Subject Property.

4.2 Valuation Reduction for Environmental Issues

An assessment of the relationship of the purchase price to the fair market value of the Subject Property, assuming there is no contamination of the property, is required under 40 CFR Part 312 Section 312.29 to maintain the innocent landowner defense. The sections from the federal document are reproduced (with edits for clarity) following:

(a) Persons to whom this part is applicable must consider whether the purchase price of the Subject Property reasonably reflects the fair market value of the property, assuming there is no contamination of the property;

(b) Persons who conclude that the purchase price of the Subject Property does not reasonably reflect the fair market value of that property, if the property were not contaminated, should consider whether or not the differential in purchase price and fair market value is due to the presence of releases or threatened releases of hazardous substances.

An appraisal of the Subject Property was not available for review; however, anecdotal information gained during interviews indicates that there is no value reduction for environmental reasons.

4.3 Assessments of Specialized Knowledge

Assessments of any specialized knowledge or experience on the part of the purchaser or landowner is required by 40 CFR Part 312 Section 312.28 to maintain the innocent landowner defense. The sections from the federal document are reproduced (with edits for clarity) following:

(a) Persons to whom this part is applicable must take into account, their specialized knowledge of the Subject Property, the area surrounding the Subject Property, the conditions of adjoining properties, and any other experience relevant to the inquiry, for the purpose of identifying conditions indicative of releases or threatened releases at the Subject Property.

(b) All appropriate inquiries are not complete unless the results of the inquiries take into account the relevant and applicable specialized knowledge and experience of the persons responsible for undertaking the inquiry.

Specialized knowledge relating to the Subject Property was obtained via interviews of persons with knowledge of the status and history of the property.

5.0 RECORDS REVIEW

The purpose of the records review is to obtain and review records that will help identify recognized environmental conditions in connection with the Subject Property. This is one of the Criteria required under the All Appropriate Inquiry, Environmental Site Assessment Phase 1 Investigation.

5.1 Standard and Additional Environmental Record Sources

The *Standard Environmental Record Sources* and the *Additional Environmental Record Sources* were obtained through a computer data bank search company, Environmental Data Resources of Milford, Connecticut. Computer data bank searches for active sites can be useful in locating sites that may have the potential to adversely impact the subject site. It is important to keep in mind that computer database searches provide general overview data and may not be precise in the data that is presented. Consequently, an investigator needs additional familiarity with active sites to properly interpret the data that is provided.

The Environmental Radius Report is included in Exhibit F. This report accessed a large number of active federal, state and local databases—some are Standard Environmental Record Sources (Section 8.2.1 ASTM E-1527-13) and others are Additional Environmental Record Sources that provide additional data and supplement the Standard Environmental Record Sources. A comprehensive listing of government records searched is listed in the Radius Report and is not repeated in the text.

EDR Database Search

Subject Property: The Subject Property appears on the standard record sources and additional environmental record sources searched and reported upon in the Radius Report.

Nelsons Auto & Truck Repair is listed on the **EDR US Historical Auto Station** database. Records list the Subject Property as operating as Nelsons Auto & Truck Repair in 1987 and 1990. Interviews with the current owner and representative familiar with the Subject Property indicate the Subject Property has always been residential in use. The occupant of the residence is believed to have used his residential address as his business mailing address.

Neighboring Properties: Summary of relevant findings of the database search within the minimum radius search distance of the property as specified by ASTM E-1527-13, Section 8.2.1 are summarized in the Table below.

U.S. Federal Databases		
Database	**ASTM Criteria Search Distance (miles)**	**Number of Properties within the Search Distance**
NPL	1.0	0
Delisted NPL	0.5	0
CERCLIS	0.5	0
CERCLIS NFRAP	0.5	0
RCRA CORRACTS facilities	1.0	0
RCRA non-CORRACTS TSD facilities	0.5	0
Generators list: RCRA_LQG	Property; adjoining property	0
Generators list: RCRA_SQG	Property; adjoining property	0
Federal Institutional / Engineering Control	Property	0
Federal ERNS List	Property	0

State, Tribal and Local Databases		
Database	**ASTM Search Distance (miles)**	**Properties within the Search Distance**
ENVIROSTOR[1]	1.0	1
SLIC	0.5	0
LUST	0.5	0
SWF/LS	0.5	0
AST[2]	Property; adjoining property	0
UST[2]	Property; adjoining property	0
Notify 65[2]	Property; adjoining property	0
Old Databases[3]	Property; adjoining property	0

Note 1: The following databases are part of Envirostor under DTSC; they are not listed individually: Cal-Sites (State equivalent to NPL is AWP, BE), Hist. Cal-Sites, Response, Institutional & Engineering Controls, VCP and Brownfield sites.
Note 2: The following databases are discussed only if the listed sites are on the property or on adjoining properties: UST, AST, and Notify 65.
Note 3: The following databases are old and are not updated; unless the sites listed are on the Subject Property or adjoining properties, they are not discussed; the databases include: Cortese; CA FID; HIST UST; & SWEEPS.

There are several sites listed within the standard ASTM search distance of 1-mile of the Subject Property. A brief review of the listed sites reveals that they are not likely threats for the Subject Property due to one or more of the following reasons: listing database not relevant, sufficient distance from Subject Property, location relative to site topography and ground water flow direction, and the status of the listed site (e.g., closed, contamination characterized, contamination under remediation, etc.)

The Environmental Radius Report is attached to this report. A summary of those sites in the report considered pertinent for the Subject Property is presented below in Section 5.4.

Other Environmental Record Sources
To enhance and supplement the Environmental Radius Report data bank searches for active sites, local records and / or additional state or tribal records were independently searched through their various websites. These records are reasonably ascertainable, and are sufficiently useful, accurate and complete in light of the objective of the records review. Other Environmental Record Sources contacted for information pertaining to the subject and nearby properties were as follows:

- U.S. EPA (http://www.epa.gov/region09/)
- California Environmental Protection Agency, Department of Toxic Substances Control (http://www.calepa.ca.gov/ and http://www.envirostor.dtsc.ca.gov/public/)
- County of Sonoma — all departments (http://www.co.Sonoma.ca.us/)
- California State Water Resources Control Board (http://geotracker.swrcb.ca.gov/)

Unified Program
The Unified Program is the consolidation of six state environmental programs into one program under the authority of a Certified Unified Program Agency. These can be a county, city or JPA (Joint Powers Authority). This program was established under the amendments to the California Health and Safety Code made by SB 1082 in 1994. The six programs are the Hazardous Materials Business Plan/Emergency Response Plan, Hazardous Waste, Tiered Permitting, Underground Storage Tanks, Aboveground Storage Tanks (SPCC only) and the Uniform Fire Code Hazardous Materials Management Plan.

A CUPA, or Certified Unified Program Agency is a local agency that has been certified by Cal EPA to implement the six state environmental programs within the local agency's jurisdiction.

The City of Santa Rosa Fire Department and the Sonoma County Department of Environmental Health are the designated local agencies for the Subject Property.

No additional records of environmental significance were found for the Subject Property.

5.2 Physical Setting

5.2.1 Topography

Exhibit C is the U. S. Department of Interior, Geological Survey Quadrangle 7.5-Minute Series topographic map. The Subject Property lies at an elevation of approximately 253 feet above mean sea level. The general topographic gradient at the Subject Property is generally west. Surface topography may be indicative of the direction of surficial groundwater flow.

5.2.2 Flood Insurance Rate Map

According to FEMA Flood Panel Maps, the Subject Property is outside the 500-year flood zone and the 100-year flood zone.

5.2.3 Geologic and Hydrogeologic Setting

Soil Conditions
The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Table 5.3.3: Soil types found near Subject Property

Soil series		Texture	Hydrologic Group	Drainage Class
1	Zamora series	Silty clay loam	Class B – Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.	Well drained
2	Wright series	Loam	Class C – Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.	Somewhat poorly drained

Note: The definition of a hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. The concept of hydric soils includes soils developed under sufficiently wet conditions to support the growth and regeneration of hydrophytic vegetation.

Groundwater Flow Direction
EDR GeoCheck-Physical Setting Source Summary provides the following site-specific hydrogeologic data.

Search Radius: 1.25 miles
Status: not found

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

One site with groundwater flow direction was identified within a radius of one mile of the Subject Property. The groundwater flow direction is reported to be south-southwest.

5.3 Results of Site History and Land Use Review

The objective of consulting historical sources is to develop a history of the previous uses of the Subject Property and surrounding area in order to identify the likelihood of past uses having led to recognized environmental conditions. All obvious uses of the property must be identified from the present back to the property's first developed use or back to 1940, whichever is earlier (§ 8.3.2 ASTM 1527-13). The Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM E1527-13) requires a review of reasonably ascertainable standard historical sources. Reasonably ascertainable is defined by ASTM as information that is publicly available, obtainable from a source with reasonable time and cost constraints, and practically reviewable. The following standard historical sources for the Subject Property were reviewed: Sanborn Fire Insurance Maps, City Directories, County Records Review, personal interviews, historical aerial photographs and previous environmental investigations.

5.3.1 Sanborn Fire Insurance Maps

Environmental Data Resources of Milford, Connecticut investigated the historic Sanborn Fire Insurance Maps. The inquiry Number is 4251606.3.

No coverage was reported.

The report is attached to this Environmental Site Assessment as a component of Exhibit F.

5.3.2 Historical Topographic Maps

Environmental Data Resources of Milford, Connecticut performed a search for historical topographic maps. The topographic maps are presented in the EDR report number 4251606.4. The report is reproduced in Exhibit E of this report.

The historical topographic maps report did not reveal any significant potential liability resulting from past activities.

5.3.3 Aerial Photographs

Environmental Data Resources of Milford, Connecticut performed a search for historic aerial photographs. The photographs are presented in the EDR report number 4251606.5. The report is reproduced in Exhibit E of this report. A synopsis of the aerial photography is presented in Table 5.4.3.

Table 5.4.3: Description of the Subject Property from aerial photographs		
DATE	**ON SITE DESCRIPTION**	**OFFSITE DESCRIPTION**
1942	No apparent structures on the property. Property is undeveloped land with a few trees in the center of the parcels.	**North:** Predominately undeveloped land with a few orchards further north. **East:** Undeveloped land. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences.
1952	No structures on the property. Property is undeveloped land with a few trees in the center of the parcels.	**North:** Predominately undeveloped land with a few orchards further north. **East:** Undeveloped land. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences.
1965	Property is predominately undeveloped land. A few single family residences appear	**North:** Predominately undeveloped land. The orchards are gone and there is commercial development further north. **East:** Predominately undeveloped land. A few rural residences appear. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences.
1968	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences
1973	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences
1982	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences

Table 5.4.3: Description of the Subject Property from aerial photographs		
DATE	**ON SITE DESCRIPTION**	**OFFSITE DESCRIPTION**
1985	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences
1993	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences
1998	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** Predominately undeveloped land with a few orchards and rural residences
2005	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Predominately undeveloped land with commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land with a few rural residences. **West:** More residences and a few commercial structures appear. A housing development appears to the south-west.
2006	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Undeveloped land is now tilled land. There is commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Predominately undeveloped land. A housing development appears immediately to the south-west. **West:** Now developed with housing developments.
2009	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Undeveloped land is now tilled land. There is commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Housing developments and tilled land. Further south is undeveloped land. **West:** Developed with housing developments.

Table 5.4.3: Description of the Subject Property from aerial photographs		
DATE	**ON SITE DESCRIPTION**	**OFFSITE DESCRIPTION**
2010	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Undeveloped land is now tilled land. There is commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Housing developments and tilled land. Further south is undeveloped land. **West:** Developed with housing developments.
2012	Property is predominately undeveloped land. The five current single family residences are all on the site.	**North:** Undeveloped land is now tilled land. There is commercial development further north. **East:** Predominately undeveloped land with a few rural residences. **South:** Housing developments and tilled land. Further south is undeveloped land. **West:** Developed with housing developments.

5.3.4 City Directory

Environmental Data Resources of Milford, Connecticut investigated historic City Directory; this report is documented in the City Directory Abstract Report with Inquiry Number 4251606.6. It is included in this report as a component of Exhibit F.

Business directories including city, cross-reference and telephone directories were reviewed, if available, at approximately five-year intervals for the years spanning 1930 through 2013. (These years are not necessarily inclusive.)

The Subject Property was listed as follows:

2574 Linwood Avenue:

Year(s)	Listing
1987-1990	Michael Nelson; Nelsons Auto & Truck Repair[1]
1970-1981	Residential

2842 Linwood Avenue:

Year(s)	Listing
1981	Residential

2862 Linwood Avenue:

Year(s)	Listing
1970-1990	Residential

1 As discussed above in Section 5.0, the property has only been residential in use. It is believed the tenant listed his residential address for business purposes.

These listings are consistent with usage as residential sites. The listings do not indicate an issue of environmental concern.

Adjacent Property listings were residential listings. Some commercial and retail listings were found. Some of these listings are for businesses that regularly generate and/or handle hazardous wastes. These sites do not indicate issues of environmental concern unless a record of contamination (such as listings in regulatory records) is found. Any such sites are discussed in Section 5.1.

5.3.5 Local Records Review

Historical Permit records for the Subject Property were researched at the Sonoma County Permit and Resources Management Department. This review included the Building and Zoning Records.

No Permit history of environmental impact related to the Subject Property at Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040 was found.

5.3.6 Synopsis of Previous and Current Environmental Investigations

No previous or current environmental investigations prior to this report were identified.

5.4 Discussion of Records Review

Subject Property
Based on the review of the database report and other records review, there are no issues that constitute a recognized environmental condition for the Subject Property. This opinion is based on current and available information.

Surrounding Properties
Sites considered potentially relevant to environmental conditions on the Subject Property based on the records review are discussed below. Sites not mentioned are judged insignificant for the Subject Property. In some cases, rather than engage in an exhaustive discussion of the various sites, these are grouped together in a summary discussion.

Summary
Based on the review of the open and active surrounding properties listed on the database report and other records review, there are none that constitute a recognized environmental condition for the Subject Property. This opinion is based on current and available information.

6.0 SITE RECONNAISSANCE

On April 7, 2015 an environmental professional performed a site reconnaissance of the Subject Property and nearby properties. The objective of the site reconnaissance is to obtain information indicating the likelihood of identifying recognized environmental conditions in connection with the property. It is not an environmental compliance audit; this process does not determine if the operations of an existing facility are in compliance with applicable environmental laws and regulations.

Photo-documentation of the property is presented in Exhibit D of this report.

6.1 Methodology and Limiting Conditions

The method used in conducting the site reconnaissance consisted of walking the perimeter of the Subject Property and inspecting as closely as possible the features of the property. Visual observations of nearby properties were performed in an effort to identify conditions that potentially could negatively impact the subject site.

6.2 General Site Setting

The general site setting is three contiguous parcels that are predominately undeveloped land with five (5) single family residences located on the western and southern perimeters of the property. The property is located in south-east Santa Rosa. Nearby properties are predominately single family residences with undeveloped land to the east and Taylor Mountain Regional Park to the south.

6.3 Subject Property

The Subject Property consists of three adjacent parcels as follows:

- APN 044-200-027 - associated street address of 2842 Linden Avenue - The parcel is approximately 0.46 acres in area with one single family residence built in 1966 located on the parcel.
- APN 044-200-029 - associated street address of 2574 Linden Avenue - The parcel is approximately 3.00 acres in area with two single family residences built in 1964 located on the parcel.
- APN 044-200-040 - associated street address of 2862 Linden Avenue - The parcel is approximately 6.89 acres in area with three single family residences built in 1963 located on the parcel.

There are five (5) single family residences in total located on the parcels. Three of the single family residences are located along the western perimeter of the parcels and two of the single family residences are located on the southern perimeter of the parcels. Four of the residences are occupied. The residence located on the south-west corner

of Taylor Mountain Place and Linden Avenue is vacant and currently being used for storage.

There is a septic system for all of the residences and there are two water wells located on the property that provide all of the water for the parcels. The remainder of the parcels are undeveloped and covered in natural grasses, shrubs and a few trees. There are two cement strips that run along the northern portion of the parcels that were used as a road way to access the middle of the property.

Access to the property is via driveways from Taylor Mountain Place on the west of the property and Linden Avenue on the south of the property.

No underground storage tanks were evident on the Subject Property.

No excessive staining or distressed vegetation was evident on the Subject Property.

In the course of the inspection no indications of recognized environmental conditions were observed.

6.4 Adjacent Properties

- **North:** Single family residences
- **East:** Undeveloped land
- **South:** Single family residences
- **West:** Single family residences

7.0 INTERVIEWS

7.1 Interviews with Past and Present Owners, Operators, and Occupants

The present owner for the Subject Property, Mr. Mark McIntosh, was interviewed in the course of this assessment. According to Mr. McIntosh:

- The Subject Property was purchased by his father over fifty years ago.
- His father built the five single family residences on the property.
- The Subject Property has only been used for residential purposes.
- The septic system has been at the Subject Property since the homes were built.
- There are two water wells located at the Subject Property. One water well services four homes and one water well services one home.
- Peterson is the company that services the water wells.
- There have never been any underground or aboveground storage tanks located at the property.
- There have never been any hazardous materials located at the Subject Property.

7.2 Interviews with Local Government Officials

Individuals were interviewed at various city and county offices that were investigated for this report.

7.3 Interviews with Others

Various individuals encountered while conducting the site reconnaissance of the site were interviewed. These brief interviews were conducted in a casual conversational manner in an attempt to determine if there are any historic factors that would indicate an impact on the property.

8.0 VAPOR ENCROACHMENT SCREENING

This section presents a Capor Encroachment Screening (VES) of the Subject Property to determine whether a Vapor Encroachment Condition (VEC) is present or likely to be present on the Subject Property. The VES was performed in conjunction with this Phase I ESA for the Subject Property in general accordance with Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions adopted by ASTM International in Method E2600-10.

The VES process as described in ASTM Standard E2600-10 is a two-tiered screening process. Tier 1 VES focuses on known or suspected contaminated properties located within the area of concern (AOC). The ASTM Standard E2600-10 defines the AOC for petroleum release sites as the area within one-tenth mile (528 feet) around the Subject Property. For non-petroleum release sites (for example, solvent release sites), the AOC is defined as the area within one-third mile (1,760 feet) around the Subject Property. In accordance with the Tier 1 VES process, a search distance test was performed to determine whether known or suspected contaminated properties are located within the AOC.

Tier 2 VES uses a plume test and critical distance determination to evaluate whether vapors from the contaminated property might migrate and encroach on the Subject Property. The critical distance between the Subject Property and a contaminated plume is defined by E2600-10 as 30 feet for dissolved petroleum hydrocarbons, and 100 feet for free-product petroleum hydrocarbons and non-petroleum chemicals of concern ("COC"). Contaminated groundwater plumes within these distances may constitute a VEC to the Subject Property.

Summary
No evidence was found for a present or likely to be present Vapor Encroachment Condition on the Subject Property.

9.0 FINDINGS

Site Description and Current Use
The Subject Property is located in the City Limits of Santa Rosa in Sonoma County. It is located approximately 1.69 miles south-east of the City Center of Santa Rosa and approximately 1.25 to the east of U. S. Highway 101 off Taylor Mountain Place. The general characteristic of the property's vicinity is single family residences with undeveloped land to the east and Taylor Mountain Regional Park to the south.

The Subject Property consists of three parcels. There are five single family residences located on the parcels. Three of the single family residences are located along the western perimeter and two of the single family residences are located along the southern perimeter. The remainder of the property is undeveloped land. The parcels are approximately 10.32 acres in total area.

Adjoining Properties Use
- **North:** Single family residences
- **East:** Undeveloped land
- **South:** Single family residences
- **West:** Single family residences

Land Use Designations
The Subject Property is zoned CSC for Commercial Shopping Center.

Standard and Additional Environmental Records Search
The Standard and Additional Environmental Records Search did not disclose issues on the Subject Property or any of the properties within the standard ASTM search radius of 1-mile that appeared to be significant for the Subject Property.

Physical Setting
The elevation of the Subject Property is at 253 feet above sea level with the general topographic gradient towards the west. Soils consist of well drained soils with very slow infiltration rates. The property is outside the 500-year and 100-year flood zones.

Historical and Present Use of Subject Property
The Subject Property appears to have been undeveloped land prior to the 1960's. In the 1960's five (5) single family residences were built on the western and southern perimeter of the site. The remainder of the property was undeveloped land. That usage has continued through the present.

Recognized Environmental Conditions
In the course of performing this All Appropriate Inquiry-Environmental Site Assessment, Phase 1 Investigation evidence of Recognized Environmental Conditions was not identified on the Subject Property.

- **Controlled Recognized Environmental Conditions**

No Controlled Recognized Environmental Conditions were identified in connection with the Subject Property.

- **Vapor Encroachment Conditions**
  No Vapor Encroachment Conditions were identified in connection with the Subject Property.

Historic Recognized Environmental Conditions
No Historic Recognized Environmental Conditions were identified in connection with the Subject Property.

Activity and Use Limitations
No Activity and Use Limitations were identified in connection with the Subject Property.

De Minimis Conditions
No de minimus conditions were found for the Subject Property.

Data Gaps
No data gaps were encountered during the performance of this investigation.

10.0 CONCLUSIONS

Harris and Lee Environmental Sciences, LLC has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527 of the property designated as Sonoma County Assessor's Parcel Number 044-200-027, -029 & -040 with the physical address of 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404, the property. Any exceptions to, or deletions from, this practice are described in Section 2.4 of this report.

This assessment has revealed no evidence of recognized environmental conditions in connection with the property.

11.0 OPINION

Harris and Lee Environmental Sciences, LLC reminds the client that it is always prudent to maintain care in handling chemicals and any hazardous materials in any building or any property. It is pertinent to be reminded that the building / property owner is ultimately responsible for the environmental compliance that occurs in any building or on any property. Thus, if a tenant is not in compliance, the owner, who has nothing to do with the tenant's operations, can be held responsible.

Recommendations
Harris and Lee Environmental Sciences, LLC recommends that no further environmental investigation is warranted on the Subject Property given the findings of this Phase I Environmental Site Assessment.

12.0 ENVIRONMENTAL PROFESSIONAL STATEMENT

We declare that, to the best of our professional knowledge and belief, we meet the definition of Environmental Professional as defined in §312.10 of 40 CFR §312. We have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the Subject Property. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

13.0 DEVIATIONS

There are no deviations in the preparation of this Environmental Site Assessment from the Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process (ASTM Designation: E-1527-13).

14.0 ADDITIONAL SERVICES

No additional services beyond the All Appropriate Inquiry, Environmental Site Assessment Phase 1 Investigation ASTM E-1527-13 Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process were added to this report.

15.0 REFERENCES

15.1 Published References

ASTM 2013, Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process, Annual Book of ASTM Standards, Standard Practice E1527-13

ASTM 2010, Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions, Standard Method E2600-10.

Environmental Protection Agency 2005, Standards and Practices for All Appropriate Inquiries; Final Rule, Part III Environmental Protection Agency, 40 Code of Federal Regulations Part 312, Federal Register Vol. 70, No. 210, Rules and Regulations, November 1, 2005

US Code Title 42, the Public Health and Welfare, Chapter 103--Comprehensive Environmental Response, Compensation, and Liability, Subchapter I- Hazardous Substances Releases, Liability, Compensation

15.2 Unpublished References

Environmental Data Resources, Inc., The EDR Radius Map with GeoCheck, Inquiry Number 4251606.2s for APM Homes, Inc, 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

Environmental Data Resources, Inc., Certified Sanborn® Map Report, Inquiry Number 4251606.3 for APM Homes, Inc, 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

Environmental Data Resources, Inc., EDR-Historical Topographic Map Report, Inquiry Number 4251606.4 for APM Homes, Inc, 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

Environmental Data Resources, Inc., The EDR Aerial Photo Decade Package, Inquiry Number 4251606.5 for APM Homes, Inc, 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

Environmental Data Resources, Inc., The EDR-City Directory Abstract, Inquiry Number 4251606.6 for APM Homes, Inc, 2574-2842 and 2862 Linwood Avenue, Santa Rosa, CA 95404

California Department of Toxic Substances, California EPA Website at www.envirostor.dtsc.ca.gov/public/

California Department of Water Resources, Division of Planning and Local Assistance Website at http://well.water.ca.gov/

California State Water Resources Control Board, Water Quality, Geographic Information System (GIS) at http://www.geotacker.swrcb.ca.gov

California Department of Conservation, Division of Mines and Geology Website at http://www.consrv.ca.gov/CGS/information/publications/cgs_notes/note_36/note_36.pdf

U. S. Environmental Protection Agency, Brownfields Cleanup and Redevelopment, All Appropriate Inquiries at http://www.epa.gov/

16.0 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

We declare that, to the best of our professional knowledge and belief, we meet the definition of Environmental Professional as defined in §312.10 of 40 CFR 312 and 12.13.2 We have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the Subject Property. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

PROFESSIONAL PROFILE

Robert S. Harris

TITLE: Partner/Senior Scientist: Harris and Lee Environmental Sciences LLC

Partner: Lee Seeley & Harris

EXPERTISE: Thirty-six (36) years experience in Environmental Analytical Chemistry and Environmental Toxicology. Efforts involved full research laboratory supervision for the University of California as well as commercial laboratories involved in Environmental Analytical Chemistry. Developed and refined the now standard method for PCB Analysis in various matrices. Mr. Harris has supported Risk Assessments, Site Audits, Health and Safety Management programs, and Hazardous Waste Management Programs. In addition, Mr. Harris has brought electronic data management technology into major petroleum industry members including Exxon, USA, Chevron USA, Texaco, USA, Mobil Oil Corporation, Atlantic Richfield (ARCO), Amarada Hess, Unocal, and Pacific Gas and Electric Company.

EXPERIENCE: Laboratory Director for the University of California for 11 years beginning in 1964; operated laboratories on the Davis Campus and the Hopland Field Station in Mendocino County, California. Published 12 research papers at the University of California

Founded Multi-Tech Laboratories in Ukiah in 1974. Established laboratories in Ukiah and Santa Rosa, CA. Multi-Tech Laboratories was one of the larger laboratories in California. During this time Mr. Harris developed several methodologies for environmental analysis, including the standard method for the analyses of Polychlorinated Biphenyls (PCB's) in water, soils and oils. When the laboratory became a part of Environmental Testing and Certification Corporation, Mr. Harris was Executive Vice President in charge of western United States operations.

Established American Technologies in 1992 and developed it in the United States and Mexico. Changed name of American Technologies to Harris and Lee Environmental Sciences in 1997. Development and refinement of the concept of environmental management where toxic risk evaluation and regulatory requirements guide the project oversight. Supervised the management and orchestration of source monitoring in Southern

California. In Northern California, developed a waste minimization program that converted waste costing $120K per month for disposal into a usable fuel to operate high pressure steam boilers.

Has carried out property transfer assessments and aided in the control and management of environmental as well as health and safety risk. In this capacity, Mr. Harris has used his knowledge of the sciences of chemistry and toxicology to properly identify risks that are real and to separate these from situations where the risk is suspected but not real. In this capacity, Mr. Harris has assisted lending institutions, insurance companies, real estate professionals and law firms in identifying chemical profiles and characteristics in toxic situations and managing environmental risk. Mr. Harris has extensive experience in litigation support and expert testimony in areas of environmental chemistry and industrial process chemistry.

ACADEMIC BACKGROUND: BS. Zoology, Minor, Chemistry, University of California, Davis, 1964
MS, Biology, emphasis Biochemistry, California State University, Sonoma, 1972

PUBLICATIONS: Published approximately 12 times in the fields of agricultural chemistry, neurophysiology and animal physiology.

SPECIALIZED TRAINING:
Varian Gas Chromatography Course
Varian Electronic Chromatograph Data Reduction
Hewlett Packard GC/MS Course I
Hewlett Packard GC/MS Course II
Risk Assessment for Hazardous Chemicals
University of California Hazardous Materials Courses
University of California Advanced Environmental Auditing
University of California, Risk Assessment Modeling, The Cal Tox Model. Presented in association with California Dept of Toxic Substances Control.
American Society for Testing and Materials, Risk Based Corrective Action

PROFESSIONAL AFFILIATIONS:
American Chemical Society
American Association for the Advancement of Science
American Water Works Association
Rotary International

CERTIFICATIONS:
California Registered Environmental Assessor - REA #4966

PROFESSIONAL PROFILE

Walter Beach

TITLE: Partner: Harris and Lee Environmental Sciences, LLC

EXPERTISE: Mr. Beach is a Registered Environmental Assessor, certified in the State of California. Mr. Beach has performed or supervised over 2,500 environmental assessments and numerous Phase II, III and IV Environmental Investigations. Mr. Beach leads the Environmental Due Diligence group within Harris and Lee Environmental Sciences, LLC.

Mr. Beach has over 25 years experience in Environmental Sciences and Management and Information Technology for Fortune 500 companies including: Charles Schwab & Co., Price Waterhouse Consulting, Novartis and Wells Fargo Bank. He specializes in Merger and Acquisition Integration, Process Improvement, Offshore Outsourcing, Project Management and Software Development and Maintenance. Mr. Beach has a unique blend of business, technical and organizational acumen to effectively communicate the issues to a range of stakeholders from individual contributors to executive leaders to solve problems always with business needs and goals in mind.

EXPERIENCE: Mr. Beach's experience includes building and managing organizations in multiple companies of all sizes. He has worked extensively in management consulting. His background is engineering and computer information technology.

Some of Mr. Beach's professional experience includes:

Performed or supervised over 2,500 environmental assessments and numerous Phase II, III and IV Environmental Investigations.

Implemented post-acquisition integration including organization restructure, technology (applications and infrastructure), brand and business processes at a Financial Organization. Included multiple geographical locations including off-shore. Successfully met aggressive budget and schedule targets.

Responsible for developing and implementing cohesive application architecture for subsidiary of Global Pharmaceutical Corporation's world-wide enterprise. Included systems and functional areas of SAP, Siebel CRM, corporate Intranet, DR/CAPA, LIMS, R&D, Finance, Human Resources, Supply Chain Management, Clinical Development, Document Management, Contingent Workforce Outsourcing and

Business Intelligence. Implemented Long Range Planning process across the Corporation. Developed comprehensive Business Intelligence strategy for all reporting and analysis needs at Chiron. Incorporated SAP BW, Cognos and Business Objects suites and numerous, international data sources. Worked on project team that implemented the first PMO for the organization. Worked closely with business and technical areas. Experienced in regulatory and CFR Part 11 requirements.

Head of Information Technology Off-shoring corporate-wide for Financial Company. Created program for utilization of offshore companies for all aspects of system life cycle work within the company. The Offshore Development Office was responsible for vendor selection, negotiating contracts, governance, infrastructure, security, and financial reporting. Demonstrated 40% project savings over traditional approaches with annual savings of $22,000,000.
Director of Technology for Capital Markets and Trading business in Brokerage. Responsible for all technology solutions and infrastructure (desktop, servers, applications, helpdesk, etc.) for business unit with over $1B annual revenue. Multiple geographic locations supported. Partnered with business to decrease unit operating costs by 42% while revenues increased by 300%. Led application development and maintenance organization of 100+. Hired skilled staff, including successor, and developed processes and tools to promote repeatable success and drive down costs. Partnered with business clients and fostered team concept and pride in work. Group achieved the finest track record of any within the company, delivering over 300 projects with 93+% success rate and receiving 15 corporate-wide awards.

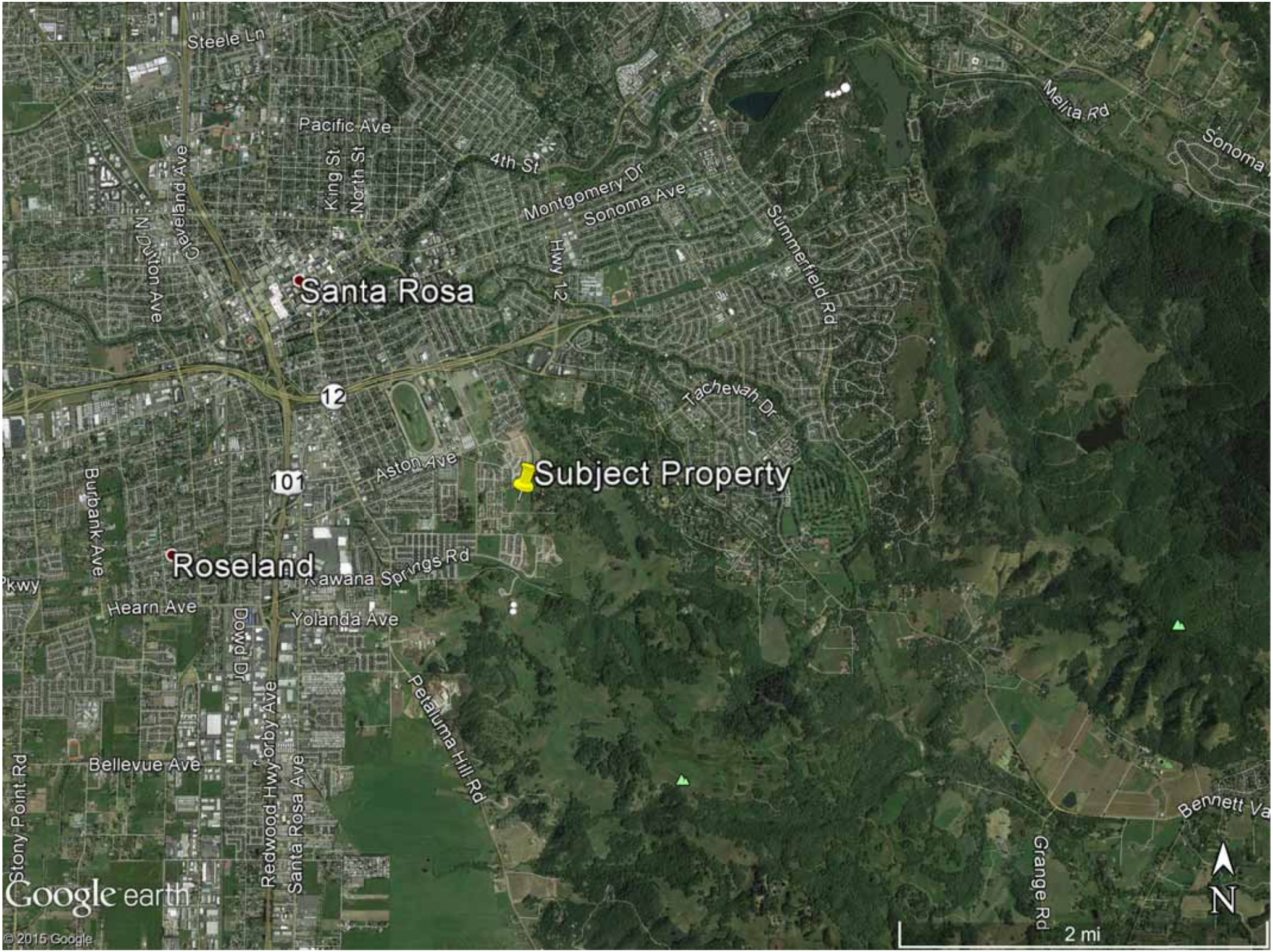
ACADEMIC BACKGROUND:
BS, Computer Engineering, Boston University, 1983
MS, Computer Science, University of California, Berkeley, 1986
MBA, Duke University-Fuqua School of Business, 1991

PATENTS: Mr. Beach holds three patents in Computer Design

PROFESSIONAL AFFILIATIONS: Rotary International; Project Management Institute; ASTM

CERTIFICATIONS: Project Management Professional
Registered Environmental Assessor

Exhibit A – Vicinity Map


Steele Ln
Pacific Ave
4th St
Montgomery Dr
Sonoma Ave
Melita Rd
Sonoma
Cleveland Ave
King St
North St
N Dutton Ave
Hwy 12
Summerfield Rd
Santa Rosa
12
Tachevah Dr
Aston Ave
Subject Property
101
Burbank Ave
Roseland
Kawana Springs Rd
Hearn Ave
Yolanda Ave
Dowd Dr
Petaluma Hill Rd
Bellevue Ave
Stony Point Rd
Redwood Hwy
Orby Ave
Santa Rosa Ave
Bennett Va
Grange Rd
Google earth
© 2015 Google
N
2 mi

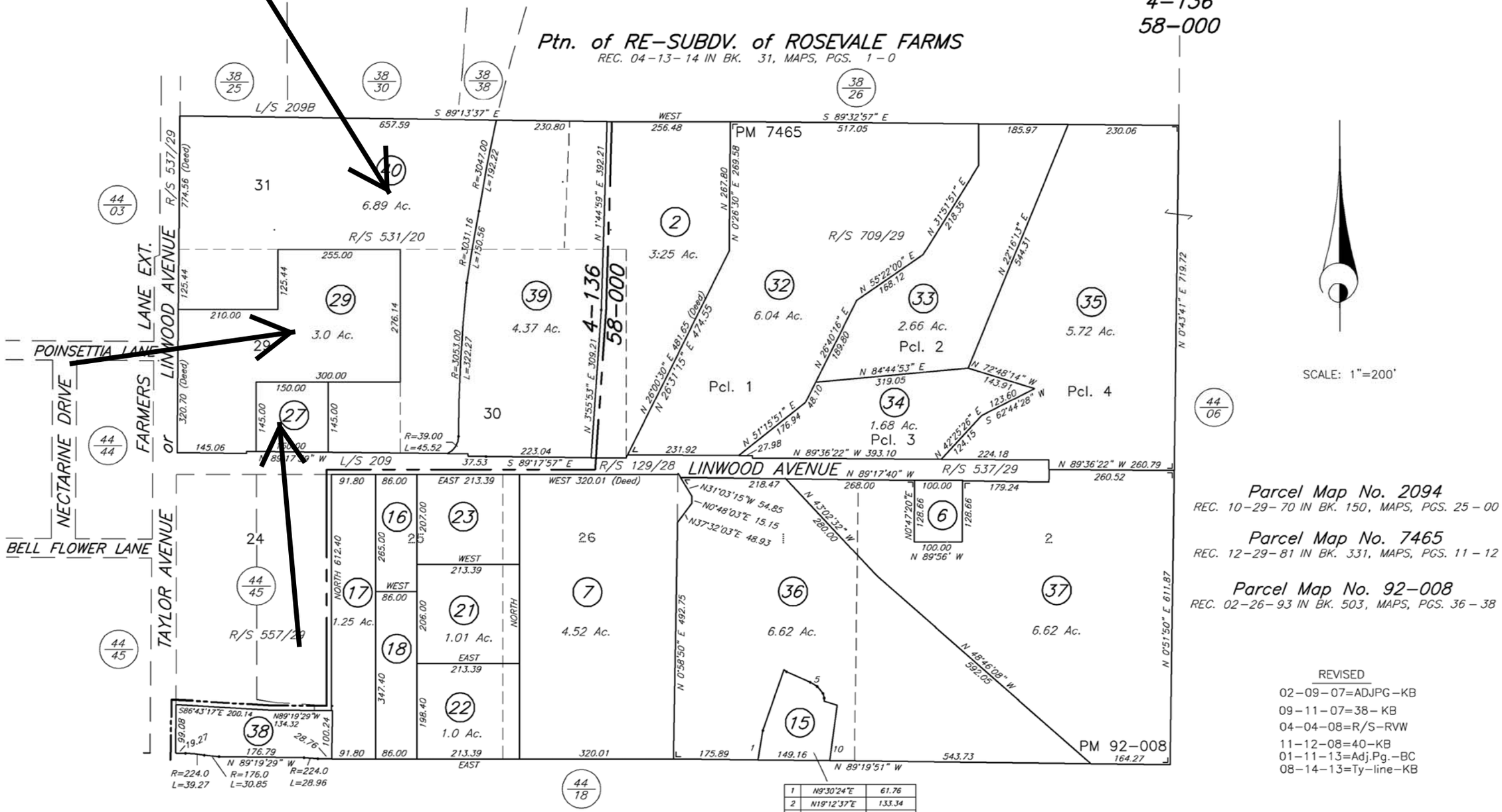
Subject Property
Google earth
© 2015 Google
300 ft
N

Exhibit B – Assessor’s Parcel Map

COUNTY ASSESSOR'S PARCEL MAP

TAX RATE AREA
4–136
58–000

044–20



Parcel Map No. 2094
REC. 10–29–70 IN BK. 150, MAPS, PGS. 25–00

Parcel Map No. 7465
REC. 12–29–81 IN BK. 331, MAPS, PGS. 11–12

Parcel Map No. 92–008
REC. 02–26–93 IN BK. 503, MAPS, PGS. 36–38

REVISED
02–09–07=ADJPG–KB
09–11–07=38–KB
04–04–08=R/S–RVW
11–12–08=40–KB
01–11–13=Adj.Pg.–BC
08–14–13=Ty–line–KB

1	N9°30'24"E	61.76
2	N19°12'37"E	133.34
3	S53°30'01"E	6.51
4	S59°04'23"E	54.00
5	S65°15'33"W	17.14
6	S39°23'26"E	18.93
7	S14°04'47"E	9.77
8	N65°15'33"W	5.65
9	S73°00'52"E	28.69
10	S7°40'24"W	116.89

NOTE: This map was prepared for Assessment purposes only and does not indicate either parcel legality or a valid building site. No liability is assumed for the accuracy of the data delineated. The acreages are based on the information supplied to the Assessor (i.e. recorded survey maps recorded deeds, prior assessment maps, etc.)

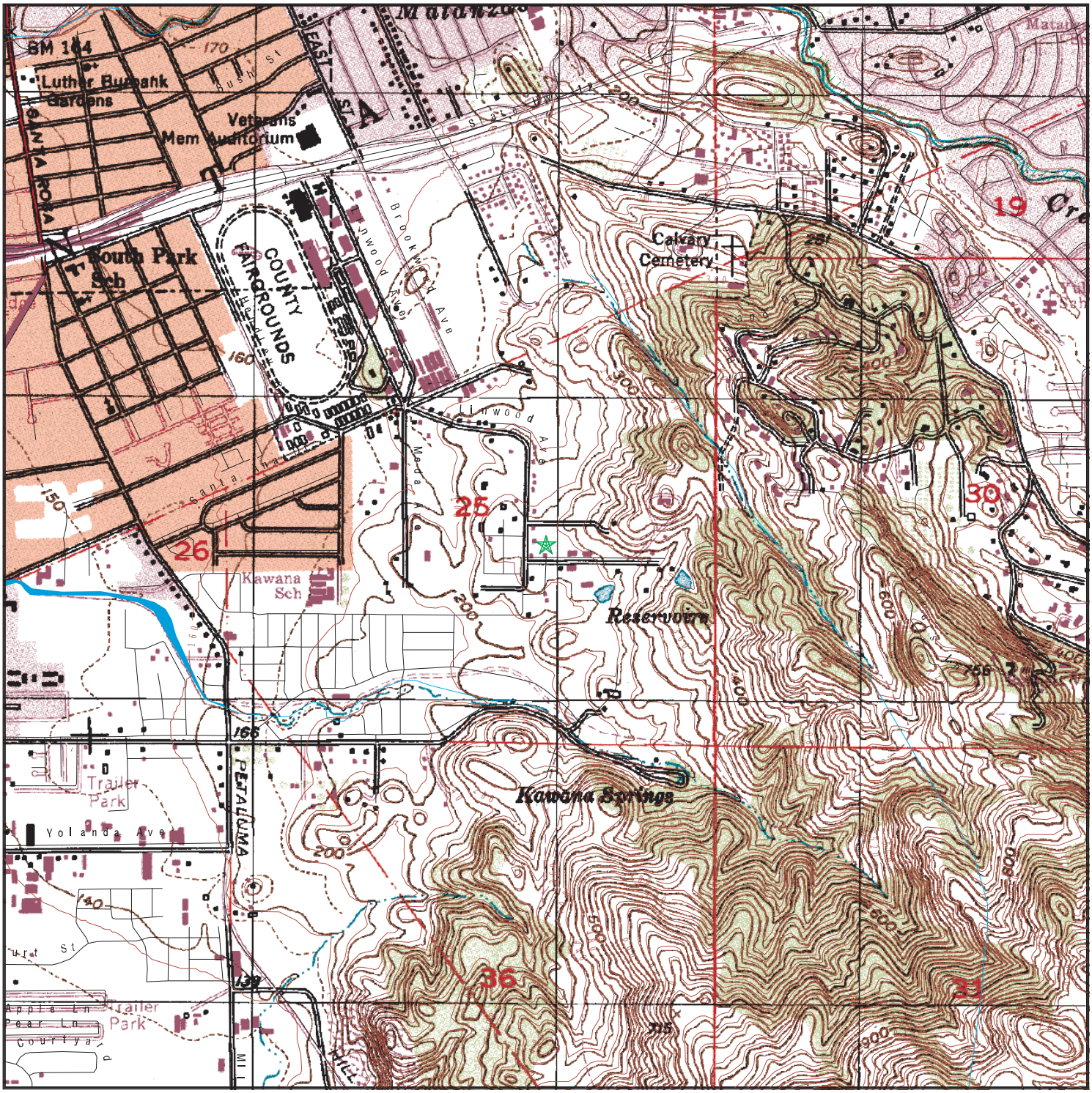
NOTE: Assessor's parcels do not necessarily constitute legal lots. To verify legal parcel status, check with the appropriate city or county community development or planning division.

Assessor's Map Bk. 044, Pg. 20
Sonoma County, Calif. (ACAD)

KEY 4/17/08 RVW

Exhibit C – U.S.G.S 7.5-Minute Topographic Map

OVERVIEW MAP - 4251606.2S



0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: APM Homes, Inc	CLIENT: Harris & Lee Env. Sciences
ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa CA 95404	CONTACT: Cathy Neumann INQUIRY #: 4251606.2s
LAT/LONG: 38.4221 / 122.6922	DATE: April 01, 2015 4:19 pm

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Exhibit D – Site Photographs

Subject Property - Linden Avenue

Subject Property - northern side - cement track

Subject Property - water wells and septic tank

Subject Property - vacant house

Subject Property - second single family residence

Subject Property - third single family residence

Subject Property - fourth single family residence

Subject Property - fifth single family residence garden

View north from Subject Property

View east from Subject Property

View south from Subject Property

View west from Subject Property

Exhibit E – Historic Topographic and Aerial Photographs

APM Homes, Inc
2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

Inquiry Number: 4251606.4
April 01, 2015

EDR Historical Topographic Map Report

6 Armstrong Road, 4th Floor
Shelton, Connecticut 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topographic Map Report

Environmental Data Resources, Inc.s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topographic Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the early 1900s.

Thank you for your business.
Please contact EDR at 1-800-352-0050
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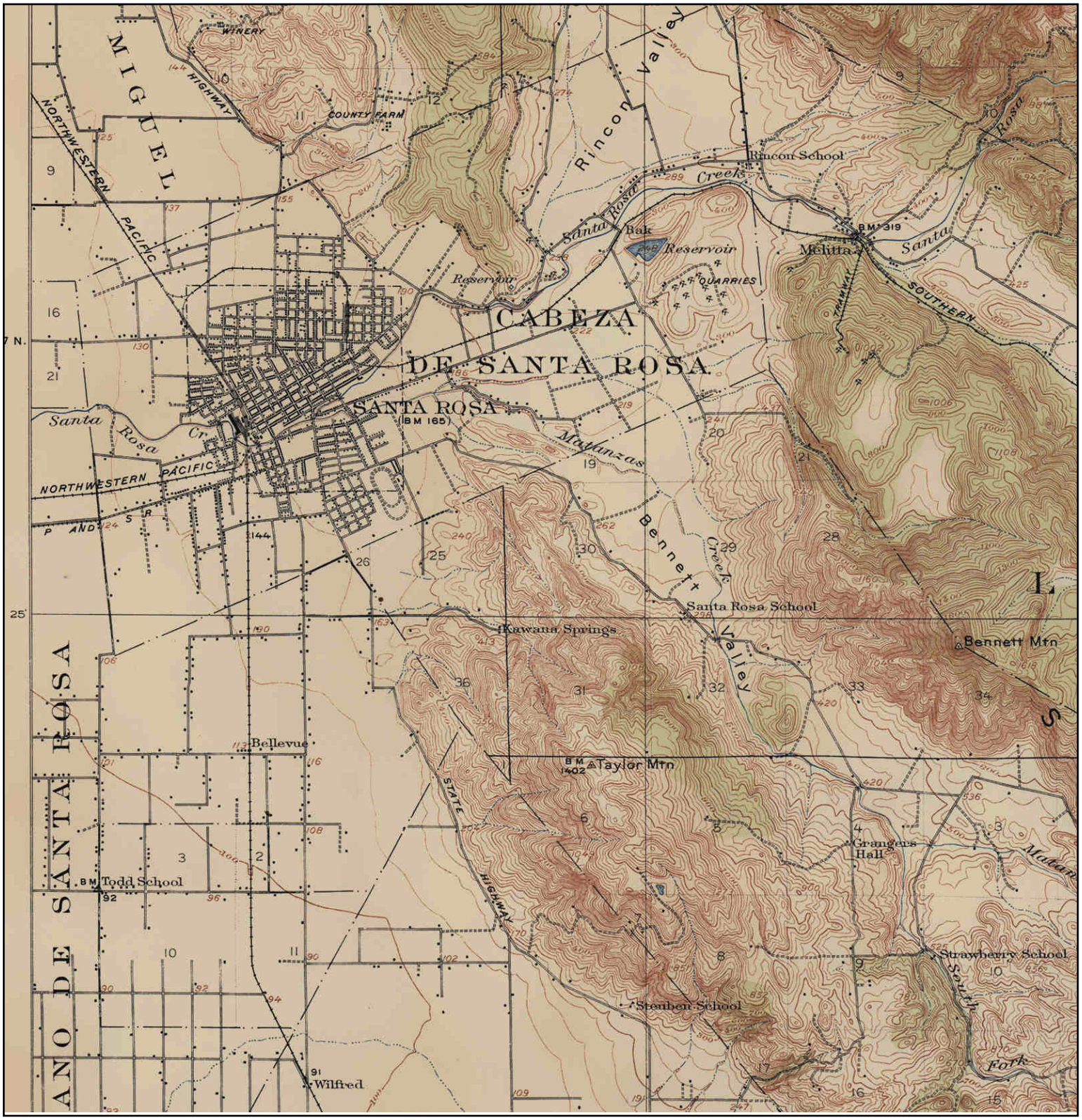
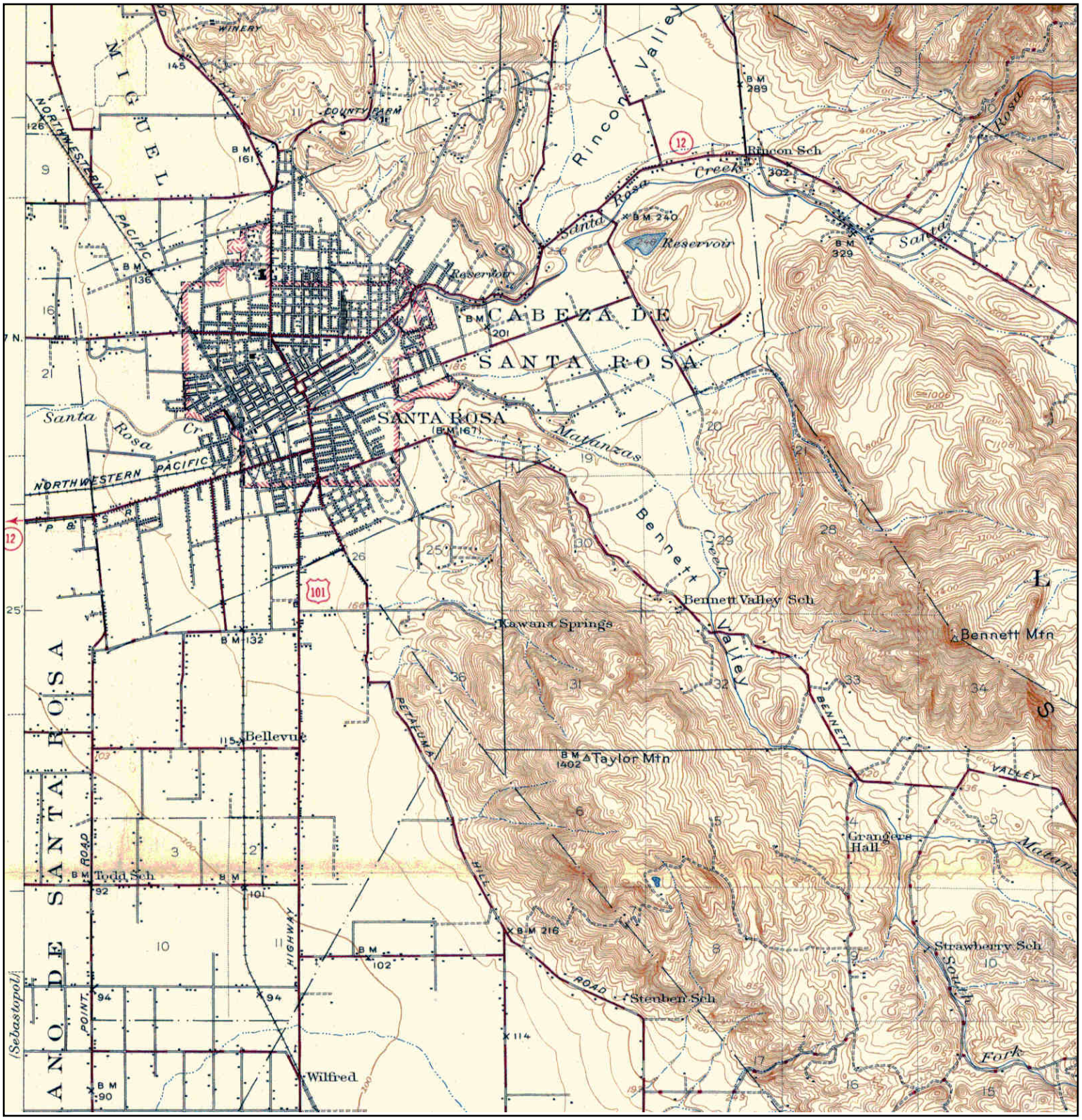
Historical Topographic Map



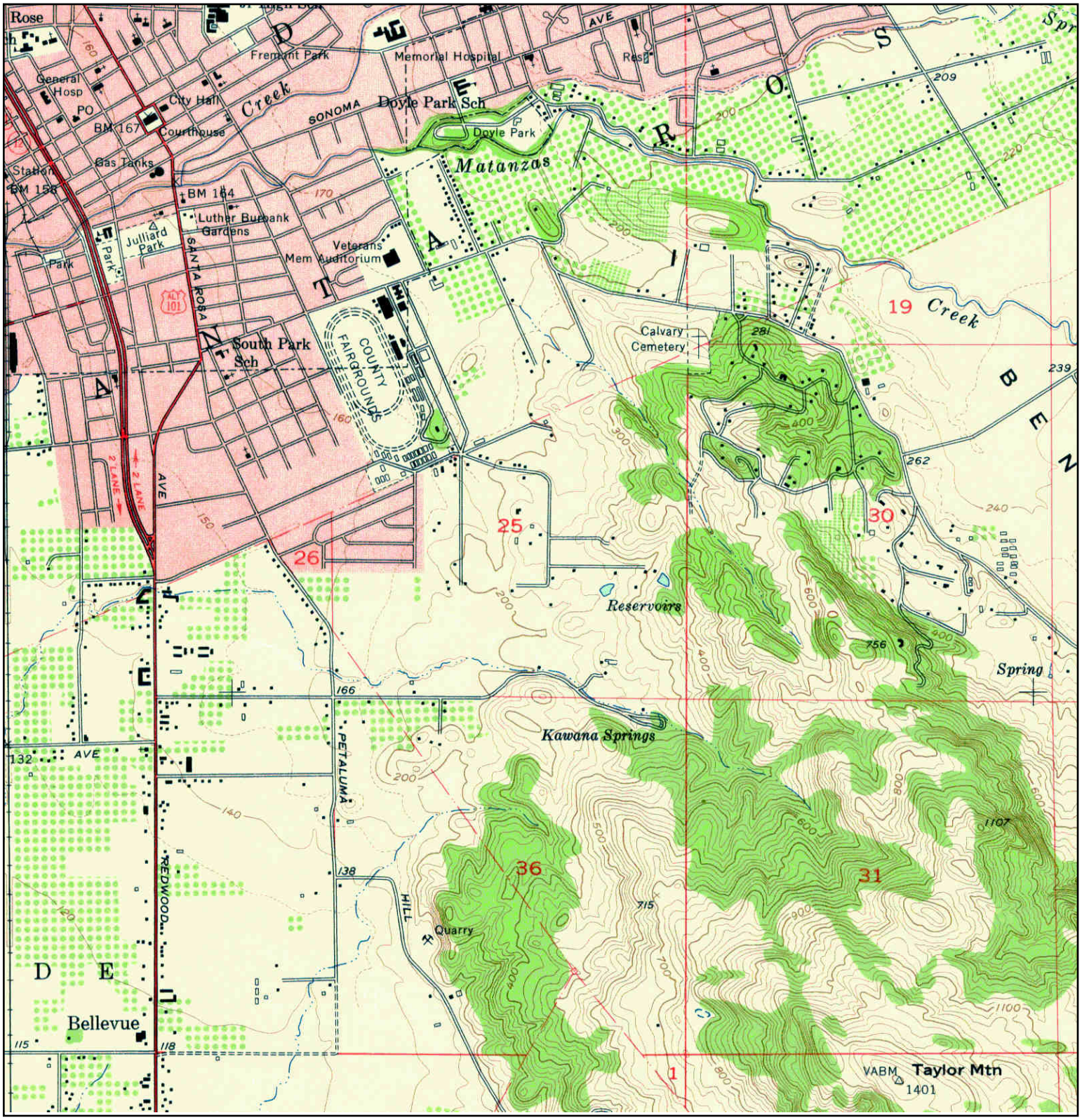
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1916 SERIES: 15 SCALE: 1:62500	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



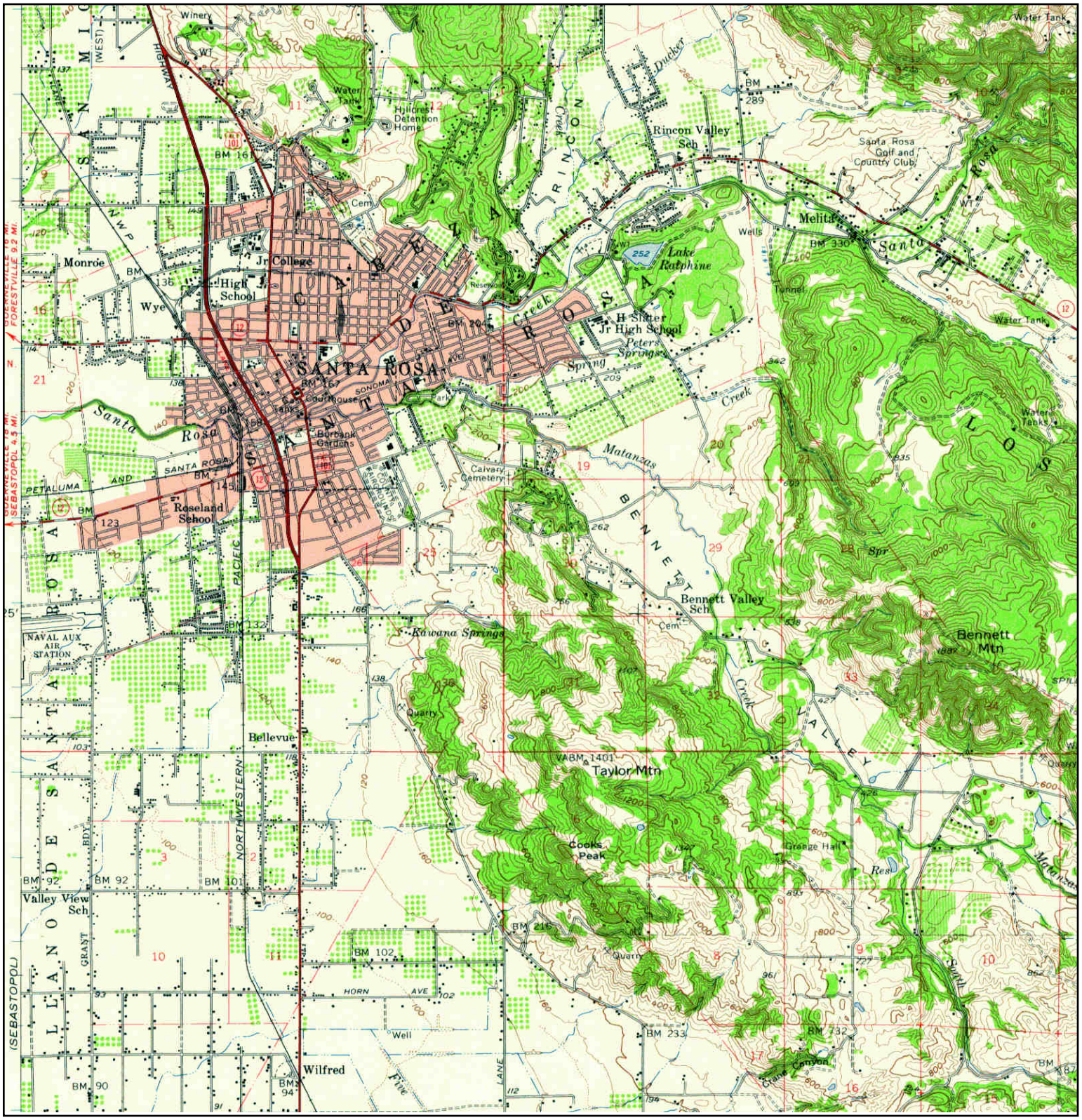
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1944 SERIES: 15 SCALE: 1:62500	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



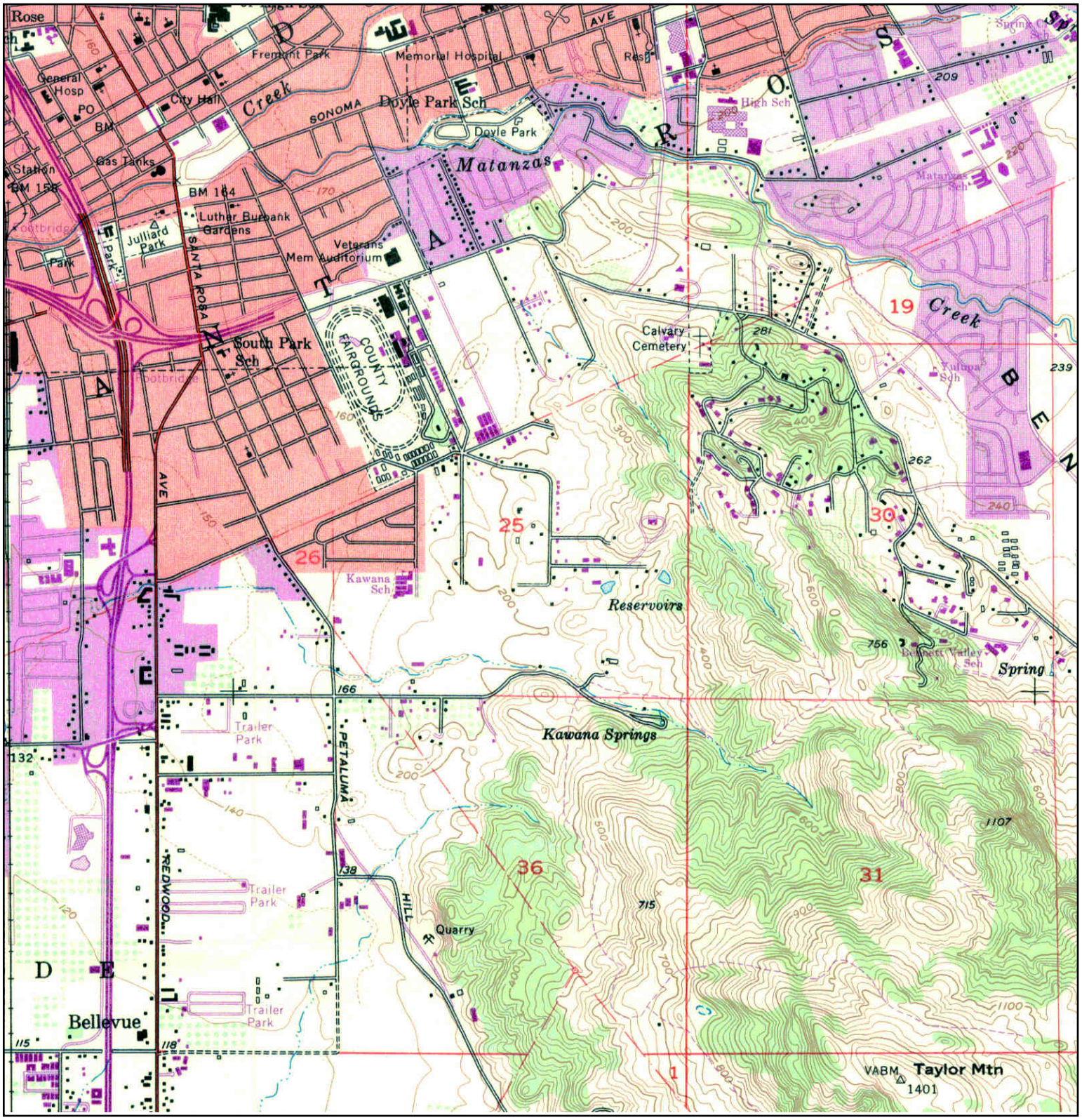
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



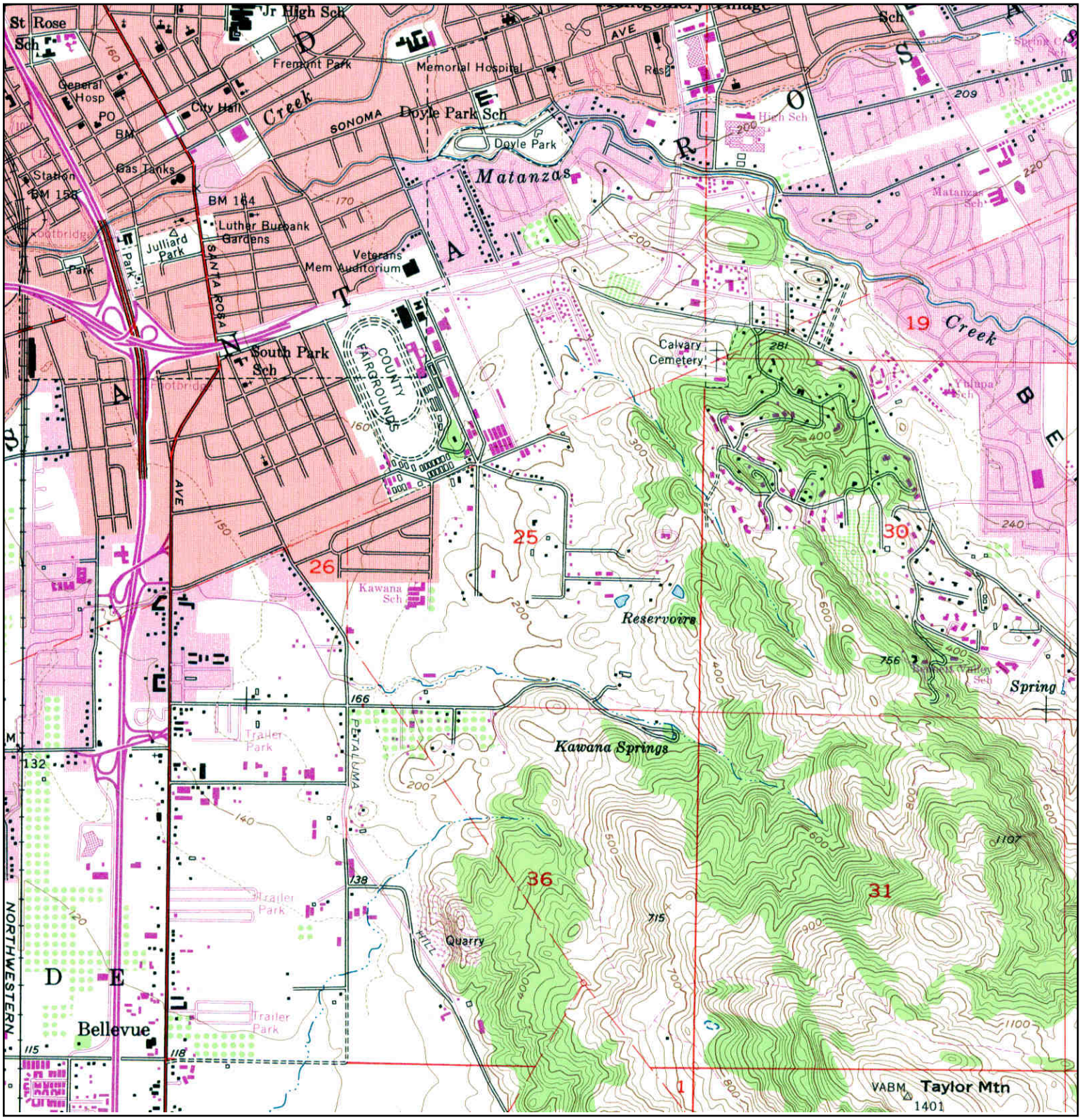
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1954 SERIES: 15 SCALE: 1:62500	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



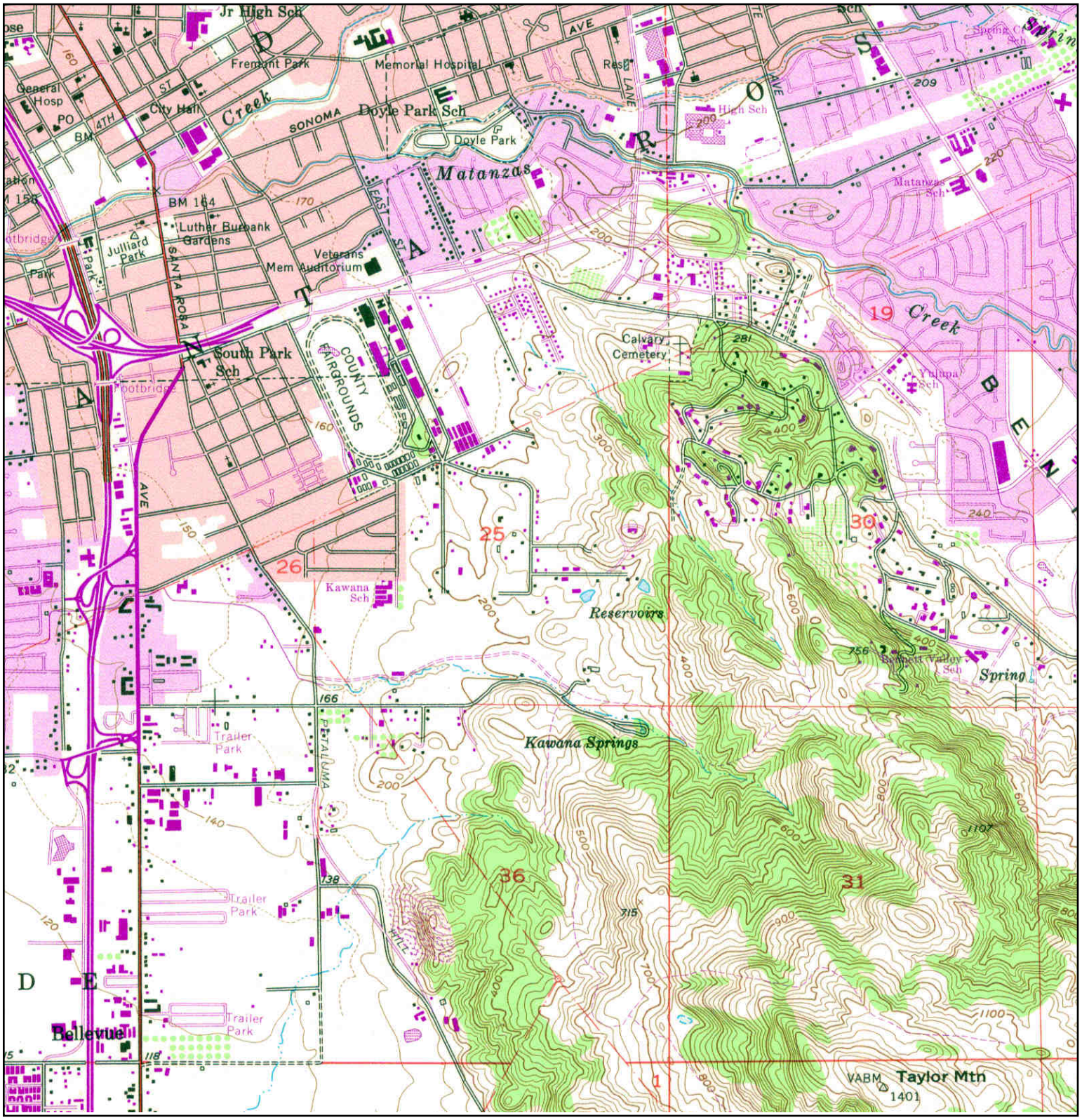
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1968 PHOTOREVISED FROM :1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



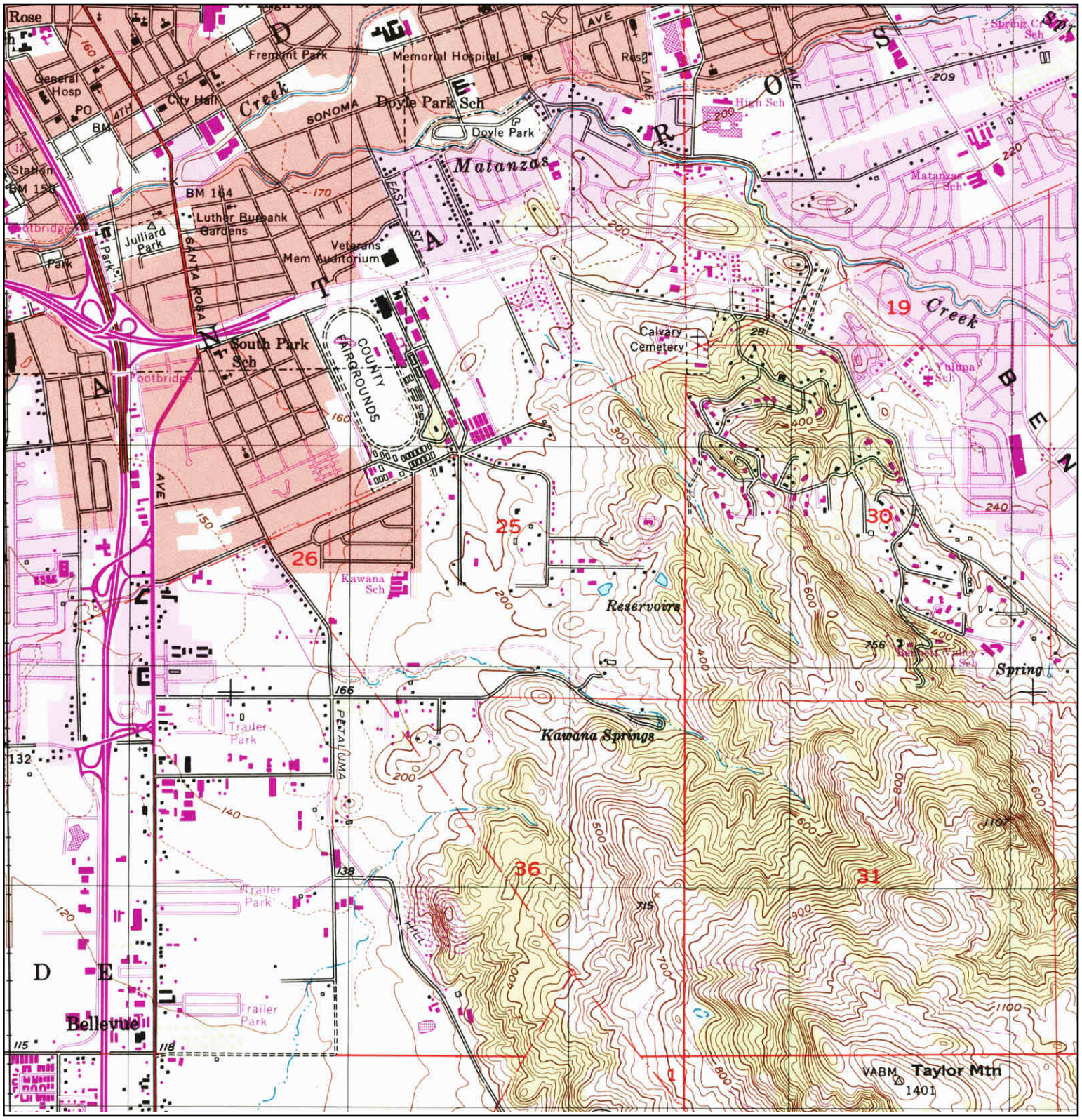
N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1973 PHOTOREVISED FROM :1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1980 PHOTOREVISED FROM :1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

Historical Topographic Map



N	TARGET QUAD NAME: SANTA ROSA MAP YEAR: 1994 SERIES: 7.5 SCALE: 1:24000	SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa, CA 95404 LAT/LONG: 38.4221 / -122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY#: 4251606.4 RESEARCH DATE: 04/01/2015

APM Homes, Inc
2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

Inquiry Number: 4251606.9
April 06, 2015

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th Floor
Shelton, Connecticut 06484
Toll Free: 800.352.0050
www.edrnet.com

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Date EDR Searched Historical Sources:

Aerial Photography April 06, 2015

Target Property:

2574-2842 and 2862 Linwood Avenue

Santa Rosa, CA 95404

Year	***Scale***	***Details***	***Source***
1942	Aerial Photograph. Scale: 1"=500'	Flight Year: 1942	USGS
1952	Aerial Photograph. Scale: 1"=500'	Flight Year: 1952	USGS
1965	Aerial Photograph. Scale: 1"=500'	Flight Year: 1965	Cartwright
1968	Aerial Photograph. Scale: 1"=500'	Flight Year: 1968	USGS
1973	Aerial Photograph. Scale: 1"=500'	Flight Year: 1973 Best Copy Available from original source	USGS
1982	Aerial Photograph. Scale: 1"=500'	Flight Year: 1982	USGS
1985	Aerial Photograph. Scale: 1"=500'	Flight Year: 1985	USGS
1993	Aerial Photograph. Scale: 1"=500'	/DOQQ - acquisition dates: 1993	USGS/DOQQ
1998	Aerial Photograph. Scale: 1"=500'	Flight Year: 1998	USGS
2005	Aerial Photograph. Scale: 1"=500'	Flight Year: 2005	USDA/NAIP
2006	Aerial Photograph. Scale: 1"=500'	Flight Year: 2006	USDA/NAIP
2009	Aerial Photograph. Scale: 1"=500'	Flight Year: 2009	USDA/NAIP
2010	Aerial Photograph. Scale: 1"=500'	Flight Year: 2010	USDA/NAIP
2012	Aerial Photograph. Scale: 1"=500'	Flight Year: 2012	USDA/NAIP

INQUIRY #: 4251606.9
YEAR: 1942
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1952
= 500'
N
EDR

SON 47-34
INQUIRY #: 4251606.9
YEAR: 1965
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1968
= 500'
N
EDR

2
INQUIRY #: 4251606.9
YEAR: 1973
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1982
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1985
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1993
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 1998
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 2005
= 500'
N
EDR

INQUIRY #: 4251606.9
YEAR: 2006
= 500'
N
EDR

INQUIRY #: 4251606.9
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EDR

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YEAR: 2010
= 500'
N
EDR

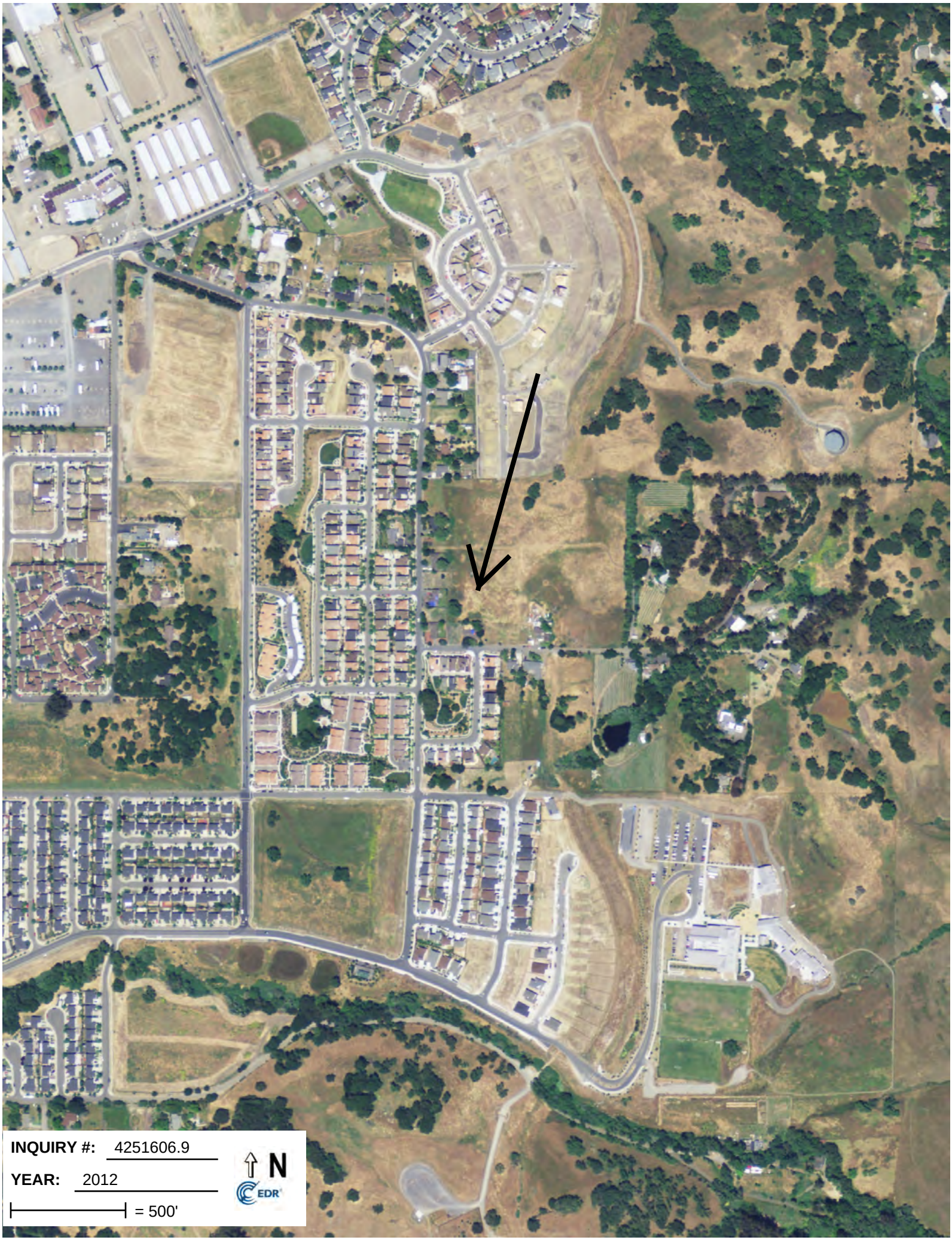
INQUIRY #: 4251606.9
YEAR: 2012
= 500'
N
EDR

Exhibit F – Environmental Data Resources Reports

APM Homes, Inc
2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

Inquiry Number: 4251606.2s
April 01, 2015

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
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Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	8
Orphan Summary	14
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting SSURGO Soil Map	A-5
Physical Setting Source Map	A-11
Physical Setting Source Map Findings	A-13
Physical Setting Source Records Searched	PSGR-1

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

2574-2842 AND 2862 LINWOOD AVENUE
SONOMA County, CA 95404

COORDINATES

Latitude (North):	38.4221000 - 38˚ 25' 19.56''
Longitude (West):	122.6922000 - 122˚ 41' 31.92''
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	526869.1
UTM Y (Meters):	4252488.0
Elevation:	253 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	38122-D6 SANTA ROSA, CA
Most Recent Revision:	1999

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20120523
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 8 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
NELSONS AUTO & TRUCK REPAIR 2574 LINWOOD AVE SANTA ROSA, CA 95404	EDR US Hist Auto Stat	N/A

EXECUTIVE SUMMARY

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ..... National Priority List
Proposed NPL ..... Proposed National Priority List Sites
NPL LIENS ..... Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ..... National Priority List Deletions

Federal CERCLIS list

CERCLIS ..... Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY ..... Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP ..... CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS ..... Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ..... RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ..... RCRA - Large Quantity Generators
RCRA-SQG ..... RCRA - Small Quantity Generators
RCRA-CESQG ..... RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS ..... Engineering Controls Sites List
US INST CONTROL ..... Sites with Institutional Controls
LUCIS ..... Land Use Control Information System

Federal ERNS list

ERNS ..... Emergency Response Notification System

State- and tribal - equivalent NPL

RESPONSE ..... State Response Sites

EXECUTIVE SUMMARY

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... Solid Waste Information System

State and tribal leaking storage tank lists

LUST..... Geotracker's Leaking Underground Fuel Tank Report
SLIC..... Statewide SLIC Cases
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST..... Active UST Facilities
AST..... Aboveground Petroleum Storage Tank Facilities
INDIAN UST..... Underground Storage Tanks on Indian Land
FEMA UST..... Underground Storage Tank Listing

State and tribal voluntary cleanup sites

INDIAN VCP..... Voluntary Cleanup Priority Listing
VCP..... Voluntary Cleanup Program Properties

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9..... Torres Martinez Reservation Illegal Dump Site Locations
ODI..... Open Dump Inventory
SWRCY..... Recycler Database
HAULERS..... Registered Waste Tire Haulers Listing
INDIAN ODI..... Report on the Status of Open Dumps on Indian Lands
WMUDS/SWAT..... Waste Management Unit Database

Local Lists of Hazardous waste / Contaminated Sites

US CDL..... Clandestine Drug Labs
HIST Cal-Sites..... Historical Calsites Database
SCH..... School Property Evaluation Program
Toxic Pits..... Toxic Pits Cleanup Act Sites
CDL..... Clandestine Drug Labs
US HIST CDL..... National Clandestine Laboratory Register

Local Land Records

LIENS 2..... CERCLA Lien Information
LIENS..... Environmental Liens Listing
DEED..... Deed Restriction Listing

Records of Emergency Release Reports

HMIRS..... Hazardous Materials Information Reporting System

CHMIRS	California Hazardous Material Incident Report System
LDS	Land Disposal Sites Listing
MCS	Military Cleanup Sites Listing
SPILLS 90	SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated
DOT OPS	Incident and Accident Data
DOD	Department of Defense Sites
FUDS	Formerly Used Defense Sites
CONSENT	Superfund (CERCLA) Consent Decrees
ROD	Records Of Decision
UMTRA	Uranium Mill Tailings Sites
US MINES	Mines Master Index File
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS	Section 7 Tracking Systems
ICIS	Integrated Compliance Information System
PADS	PCB Activity Database System
MLTS	Material Licensing Tracking System
RADINFO	Radiation Information Database
FINDS	Facility Index System/Facility Registry System
RAATS	RCRA Administrative Action Tracking System
RMP	Risk Management Plans
CA BOND EXP. PLAN	Bond Expenditure Plan
UIC	UIC Listing
NPDES	NPDES Permits Listing
Cortese	"Cortese" Hazardous Waste & Substances Sites List
HIST CORTESE	Hazardous Waste & Substance Site List
CUPA Listings	CUPA Resources List
DRYCLEANERS	Cleaner Facilities
WIP	Well Investigation Program Case List
ENF	Enforcement Action Listing
HAZNET	Facility and Manifest Data
EMI	Emissions Inventory Data
INDIAN RESERV	Indian Reservations
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
LEAD SMELTERS	Lead Smelter Sites
HWP	EnviroStor Permitted Facilities Listing
HWT	Registered Hazardous Waste Transporter Database
PROC	Certified Processors Database
Financial Assurance	Financial Assurance Information Listing
EPA WATCH LIST	EPA WATCH LIST
US FIN ASSUR	Financial Assurance Information
WDS	Waste Discharge System
MWMP	Medical Waste Management Program Listing
PCB TRANSFORMER	PCB Transformer Registration Database
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
US AIRS	Aerometric Information Retrieval System Facility Subsystem
PRP	Potentially Responsible Parties
2020 COR ACTION	2020 Corrective Action Program List

EXECUTIVE SUMMARY

COAL ASH DOE..... Steam-Electric Plant Operation Data

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP..... EDR Proprietary Manufactured Gas Plants
EDR US Hist Cleaners..... EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF..... Recovered Government Archive Solid Waste Facilities List
RGA LUST..... Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

ENVIROSTOR: The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

A review of the ENVIROSTOR list, as provided by EDR, and dated 03/11/2015 has revealed that there is 1 ENVIROSTOR site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
BURT STREET DEVELOPMENT	***YOLANDA & PETALUMA ROAD***	***SW 1/2 - 1 (0.990 mi.)***	***5***	***11***
Status: No Further Action				

EXECUTIVE SUMMARY

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Registered Storage Tanks

CA FID UST: The Facility Inventory Database contains active and inactive underground storage tank locations. The source is the State Water Resource Control Board.

A review of the CA FID UST list, as provided by EDR, and dated 10/31/1994 has revealed that there is 1 CA FID UST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
GERTRUDE VAN STEYN	***3286 LINWOOD AVE***	***E 1/8 - 1/4 (0.236 mi.)***	***A3***	***9***

HIST UST: Historical UST Registered Database.

A review of the HIST UST list, as provided by EDR, and dated 10/15/1990 has revealed that there is 1 HIST UST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
GERTRUDE VAN STEYN	3286 LINWOOD AVE	E 1/8 - 1/4 (0.236 mi.)	A2	8

SWEEPS UST: Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

A review of the SWEEPS UST list, as provided by EDR, and dated 06/01/1994 has revealed that there is 1 SWEEPS UST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
GERTRUDE VAN STEYN	***3286 LINWOOD AVE***	***E 1/8 - 1/4 (0.236 mi.)***	***A3***	***9***

Other Ascertainable Records

Notify 65: Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

A review of the Notify 65 list, as provided by EDR, and dated 10/21/1993 has revealed that there are 2 Notify 65 sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
SANTA ROSA CREEK	FARMERS LANE	NNE 1/2 - 1 (0.996 mi.)	6	13

Lower Elevation	Address	Direction / Distance	Map ID	Page
SONOMA COUNTY FAIR GROUNDS	***1350 BENNETT VALLEY ROA***	***NW 1/2 - 1 (0.922 mi.)***	***4***	***10***

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 4251606.2S

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- Areas of Concern

0 1/4 1/2 1 Miles

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	APM Homes, Inc	CLIENT:	Harris & Lee Env. Sciences
ADDRESS:	2574-2842 and 2862 Linwood Avenue Santa Rosa CA 95404	CONTACT:	Cathy Neumann
LAT/LONG:	38.4221 / 122.6922	INQUIRY #:	4251606.2s
		DATE:	April 01, 2015 4:19 pm

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DETAIL MAP - 4251606.2S

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites

0 1/16 1/8 1/4 Miles

- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: APM Homes, Inc ADDRESS: 2574-2842 and 2862 Linwood Avenue Santa Rosa CA 95404 LAT/LONG: 38.4221 / 122.6922	CLIENT: Harris & Lee Env. Sciences CONTACT: Cathy Neumann INQUIRY #: 4251606.2s DATE: April 01, 2015 4:21 pm

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
RESPONSE	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
ENVIROSTOR	1.000		0	0	0	1	NR	1
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
SLIC	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HAULERS	TP		NR	NR	NR	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
WMUDS/SWAT	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
HIST Cal-Sites	1.000		0	0	0	0	NR	0
SCH	0.250		0	0	NR	NR	NR	0
Toxic Pits	1.000		0	0	0	0	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Lists of Registered Storage Tanks								
CA FID UST	0.250		0	1	NR	NR	NR	1
HIST UST	0.250		0	1	NR	NR	NR	1
SWEEPS UST	0.250		0	1	NR	NR	NR	1
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
LIENS	TP		NR	NR	NR	NR	NR	0
DEED	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
CHMIRS	TP		NR	NR	NR	NR	NR	0
LDS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
MCS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
CA BOND EXP. PLAN	1.000		0	0	0	0	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
Cortese	0.500		0	0	0	NR	NR	0
HIST CORTESE	0.500		0	0	0	NR	NR	0
CUPA Listings	0.250		0	0	NR	NR	NR	0
Notify 65	1.000		0	0	0	2	NR	2
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
WIP	0.250		0	0	NR	NR	NR	0
ENF	TP		NR	NR	NR	NR	NR	0
HAZNET	TP		NR	NR	NR	NR	NR	0
EMI	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
HWP	1.000		0	0	0	0	NR	0
HWT	0.250		0	0	NR	NR	NR	0
PROC	0.500		0	0	0	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
WDS	TP		NR	NR	NR	NR	NR	0
MWMP	0.250		0	0	NR	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250	1	0	0	NR	NR	NR	1
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1
Target
Property

Actual:
253 ft.

NELSONS AUTO & TRUCK REPAIR
2574 LINWOOD AVE
SANTA ROSA, CA 95404

EDR US Hist Auto Stat **1014186709**
N/A

EDR Historical Auto Stations:

Name:	NELSONS AUTO & TRUCK REPAIR
Year:	1987
Type:	AUTOMOBILE REPAIRING
Name:	NELSONS AUTO & TRUCK REPAIR
Year:	1990
Type:	AUTOMOBILE REPAIRING

A2
East
1/8-1/4
0.236 mi.
1245 ft.

Site 1 of 2 in cluster A

Relative:
Higher

Actual:
297 ft.

GERTRUDE VAN STEYN
3286 LINWOOD AVE
SANTA ROSA, CA 95404

HIST UST **U001609408**
N/A

HIST UST:

Region:	STATE
Facility ID:	00000064699
Facility Type:	Other
Other Type:	PRIVATE USE
Contact Name:	Not reported
Telephone:	7075420378
Owner Name:	GERTRUDE VAN STEYN
Owner Address:	3286 LINWOOD AVE.
Owner City,St,Zip:	SANTA ROSA, CA 95404
Total Tanks:	0002
Tank Num:	001
Container Num:	2
Year Installed:	Not reported
Tank Capacity:	00000000
Tank Used for:	PRODUCT
Type of Fuel:	REGULAR
Container Construction Thickness:	12
Leak Detection:	Stock Inventor
Tank Num:	002
Container Num:	1
Year Installed:	Not reported
Tank Capacity:	00000550
Tank Used for:	PRODUCT
Type of Fuel:	UNLEADED
Container Construction Thickness:	12
Leak Detection:	Stock Inventor

A3 East 1/8-1/4 0.236 mi. 1245 ft. | **GERTRUDE VAN STEYN**
3286 LINWOOD AVE
SANTA ROSA, CA 95401

Site 2 of 2 in cluster A

CA FID UST | **S101627274**
SWEEPS UST | **N/A**

Relative: Higher

Actual: 297 ft.

CA FID UST:

Facility ID:	49003831
Regulated By:	UTNKA
Regulated ID:	00064699
Cortese Code:	Not reported
SIC Code:	Not reported
Facility Phone:	7075420378
Mail To:	Not reported
Mailing Address:	3286 LINWOOD AVE
Mailing Address 2:	Not reported
Mailing City,St,Zip:	SANTA ROSA 95404
Contact:	Not reported
Contact Phone:	Not reported
DUNs Number:	Not reported
NPDES Number:	Not reported
EPA ID:	Not reported
Comments:	Not reported
Status:	Active

SWEEPS UST:

Status:	Active
Comp Number:	64699
Number:	9
Board Of Equalization:	Not reported
Referral Date:	07-01-85
Action Date:	Not reported
Created Date:	02-29-88
Owner Tank Id:	2
SWRCB Tank Id:	49-060-064699-000001
Tank Status:	A
Capacity:	Not reported
Active Date:	07-01-85
Tank Use:	M.V. FUEL
STG:	P
Content:	LEADED
Number Of Tanks:	2

Status:	Active
Comp Number:	64699
Number:	9
Board Of Equalization:	Not reported
Referral Date:	07-01-85
Action Date:	Not reported
Created Date:	02-29-88
Owner Tank Id:	1
SWRCB Tank Id:	49-060-064699-000002
Tank Status:	A
Capacity:	550
Active Date:	07-01-85
Tank Use:	M.V. FUEL
STG:	P
Content:	REG UNLEADED
Number Of Tanks:	Not reported

4 NW 1/2-1 0.922 mi. 4869 ft.

SONOMA COUNTY FAIR GROUNDS
1350 BENNETT VALLEY ROAD
SANTA ROSA, CA 95402

RCRA-SQG 1000334191
LUST CAD981406341
Notify 65

Relative: Lower

Actual: 171 ft.

RCRA-SQG:

Date form received by agency:	05/07/1986
Facility name:	SONOMA COUNTY FAIR GROUNDS
Facility address:	1350 BENNETT VALLEY ROAD SANTA ROSA, CA 95402
EPA ID:	CAD981406341
Mailing address:	55 STONY POINT ROAD SANTA ROSA, CA 95402
Contact:	ENVIRONMENTAL MANAGER
Contact address:	1350 BENNETT VALLEY ROAD SANTA ROSA, CA 95402
Contact country:	US
Contact telephone:	(707) 576-5358
Contact email:	Not reported
EPA Region:	09
Classification:	Small Small Quantity Generator
Description:	Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time

Owner/Operator Summary:

Owner/operator name:	NOT REQUIRED
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	County
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	SONOMA COUNTY
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	County
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No

SONOMA COUNTY FAIR GROUNDS (Continued) **1000334191**

Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

LUST REG 1:

Region:	1
Facility ID:	1TSR269
Staff Initials:	Closed

NOTIFY 65:

Date Reported:	Not reported
Staff Initials:	Not reported
Board File Number:	Not reported
Facility Type:	Not reported
Discharge Date:	Not reported
Incident Description:	93582

5
SW
1/2-1
0.990 mi.
5228 ft.

BURT STREET DEVELOPMENT **VCP** **S102860966**
YOLANDA & PETALUMA ROADS **ENVIROSTOR** **N/A**
SANTA ROSA, CA 95404

Relative:
Lower

Actual:
153 ft.

VCP:

Facility ID:	49010001
Site Type:	Voluntary Cleanup
Site Type Detail:	Voluntary Cleanup
Site Mgmt. Req.:	NONE SPECIFIED
Acres:	34
National Priorities List:	NO
Cleanup Oversight Agencies:	SMBRP
Lead Agency:	SMBRP
Lead Agency Description:	DTSC - Site Cleanup Program
Project Manager:	Not reported
Supervisor:	Mark Piros
Division Branch:	Cleanup Berkeley
Site Code:	200821
Assembly:	04
Senate:	02
Special Programs Code:	Voluntary Cleanup Program
Status:	No Further Action
Status Date:	09/10/1997
Restricted Use:	NO
Funding:	Responsible Party
Lat/Long:	38.40833 / -122.7083
APN:	NONE SPECIFIED
Past Use:	NONE
Potential COC:	NONE SPECIFIED,31000
Confirmed COC:	31000
Potential Description:	NMA
Alias Name:	110033617236
Alias Type:	EPA (FRS #)

BURT STREET DEVELOPMENT (Continued) **S102860966**

Alias Name: 200821
Alias Type: Project Code (Site Code)
Alias Name: 49010001
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Voluntary Cleanup Agreement
Completed Date: 05/27/1997
Comments: Signed VCA.

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: *Voluntary Cleanup Agreement Completion
Completed Date: 09/10/1997
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Endangerment Assessment Report
Completed Date: 09/10/1997
Comments: Completed VCA. Completed PEA which recommended no further action for DTSC.

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

ENVIROSTOR:
Facility ID: 49010001
Status: No Further Action
Status Date: 09/10/1997
Site Code: 200821
Site Type: Voluntary Cleanup
Site Type Detailed: Voluntary Cleanup
Acres: 34
NPL: NO
Regulatory Agencies: SMBRP
Lead Agency: SMBRP
Program Manager: Not reported
Supervisor: Mark Piros
Division Branch: Cleanup Berkeley
Assembly: 04
Senate: 02
Special Program: Voluntary Cleanup Program
Restricted Use: NO
Site Mgmt Req: NONE SPECIFIED
Funding: Responsible Party
Latitude: 38.40833
Longitude: -122.7083

BURT STREET DEVELOPMENT (Continued) **S102860966**

APN: NONE SPECIFIED
Past Use: NONE
Potential COC: NONE SPECIFIED No Contaminants found
Confirmed COC: No Contaminants found
Potential Description: NMA
Alias Name: 110033617236
Alias Type: EPA (FRS #)
Alias Name: 200821
Alias Type: Project Code (Site Code)
Alias Name: 49010001
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Voluntary Cleanup Agreement
Completed Date: 05/27/1997
Comments: Signed VCA.

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: *Voluntary Cleanup Agreement Completion
Completed Date: 09/10/1997
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Endangerment Assessment Report
Completed Date: 09/10/1997
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Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

6
NNE
1/2-1
0.996 mi.
5258 ft.

SANTA ROSA CREEK
FARMERS LANE
SANTA ROSA, CA 93582

Notify 65 **S100178378**
N/A

Relative:
Higher

Actual:
254 ft.

NOTIFY 65:
Date Reported: Not reported
Staff Initials: Not reported
Board File Number: Not reported
Facility Type: Not reported
Discharge Date: Not reported
Incident Description: 93582

Count: 0 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
		NO SITES FOUND			

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 12/16/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: EPA
Telephone: N/A
Last EDR Contact: 01/08/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 12/16/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: EPA
Telephone: N/A
Last EDR Contact: 01/08/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 12/16/2014	Source: EPA
Date Data Arrived at EDR: 01/08/2015	Telephone: N/A
Date Made Active in Reports: 02/09/2015	Last EDR Contact: 01/08/2015
Number of Days to Update: 32	Next Scheduled EDR Contact: 04/20/2015
	Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 10/25/2013	Source: EPA
Date Data Arrived at EDR: 11/11/2013	Telephone: 703-412-9810
Date Made Active in Reports: 02/13/2014	Last EDR Contact: 02/27/2015
Number of Days to Update: 94	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 07/21/2014	Source: Environmental Protection Agency
Date Data Arrived at EDR: 10/07/2014	Telephone: 703-603-8704
Date Made Active in Reports: 10/20/2014	Last EDR Contact: 01/09/2015
Number of Days to Update: 13	Next Scheduled EDR Contact: 04/20/2015
	Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 10/25/2013	Source: EPA
Date Data Arrived at EDR: 11/11/2013	Telephone: 703-412-9810
Date Made Active in Reports: 02/13/2014	Last EDR Contact: 02/27/2015
Number of Days to Update: 94	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 09/18/2014
Date Data Arrived at EDR: 09/19/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 09/18/2014
Date Data Arrived at EDR: 09/19/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/03/2014
Date Data Arrived at EDR: 12/12/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 48

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 09/30/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 37

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

State- and tribal - equivalent NPL

RESPONSE: State Response Sites

Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/12/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 6

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/12/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

ENVIROSTOR: EnviroStor Database

The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/12/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 6

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/12/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

State and tribal landfill and/or solid waste disposal site lists

SWF/LF (SWIS): Solid Waste Information System

Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 02/16/2015
Date Data Arrived at EDR: 02/17/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 14

Source: Department of Resources Recycling and Recovery
Telephone: 916-341-6320
Last EDR Contact: 02/17/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

State and tribal leaking storage tank lists

LUST REG 9: Leaking Underground Storage Tank Report

Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 03/01/2001
Date Data Arrived at EDR: 04/23/2001
Date Made Active in Reports: 05/21/2001
Number of Days to Update: 28

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-637-5595
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: No Update Planned

LUST REG 8: Leaking Underground Storage Tanks

California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/14/2005
Date Data Arrived at EDR: 02/15/2005
Date Made Active in Reports: 03/28/2005
Number of Days to Update: 41

Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-4496
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Varies

LUST REG 7: Leaking Underground Storage Tank Case Listing

Leaking Underground Storage Tank locations. Imperial, Riverside, San Diego, Santa Barbara counties.

Date of Government Version: 02/26/2004
Date Data Arrived at EDR: 02/26/2004
Date Made Active in Reports: 03/24/2004
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-776-8943
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

LUST REG 6V: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Inyo, Kern, Los Angeles, Mono, San Bernardino counties.

Date of Government Version: 06/07/2005
Date Data Arrived at EDR: 06/07/2005
Date Made Active in Reports: 06/29/2005
Number of Days to Update: 22

Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-241-7365
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 6L: Leaking Underground Storage Tank Case Listing
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/2003
Date Data Arrived at EDR: 09/10/2003
Date Made Active in Reports: 10/07/2003
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 530-542-5572
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 5: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank locations. Alameda, Alpine, Amador, Butte, Colusa, Contra Costa, Calveras, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba counties.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 07/22/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 9

Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-4834
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: No Update Planned

LUST REG 4: Underground Storage Tank Leak List
Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6710
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

LUST REG 3: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank locations. Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz counties.

Date of Government Version: 05/19/2003
Date Data Arrived at EDR: 05/19/2003
Date Made Active in Reports: 06/02/2003
Number of Days to Update: 14

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-542-4786
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: No Update Planned

LUST REG 2: Fuel Leak List
Leaking Underground Storage Tank locations. Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-622-2433
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

LUST REG 1: Active Toxic Site Investigation
Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/2001
Date Data Arrived at EDR: 02/28/2001
Date Made Active in Reports: 03/29/2001
Number of Days to Update: 29

Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-570-3769
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

LUST: Geotracker's Leaking Underground Fuel Tank Report

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state. For more information on a particular leaking underground storage tank sites, please contact the appropriate regulatory agency.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 6

Source: State Water Resources Control Board
Telephone: see region list
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

SLIC: Statewide SLIC Cases

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 6

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Varies

SLIC REG 1: Active Toxic Site Investigations

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2003
Date Data Arrived at EDR: 04/07/2003
Date Made Active in Reports: 04/25/2003
Number of Days to Update: 18

Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/18/2006
Date Data Arrived at EDR: 05/18/2006
Date Made Active in Reports: 06/15/2006
Number of Days to Update: 28

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: Semi-Annually

SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/17/2004
Date Data Arrived at EDR: 11/18/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 47

Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: Varies

SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/01/2005
Date Data Arrived at EDR: 04/05/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 16

Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/24/2005
Date Data Arrived at EDR: 05/25/2005
Date Made Active in Reports: 06/16/2005
Number of Days to Update: 22

Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Semi-Annually

SLIC REG 6L: SLIC Sites
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

SLIC REG 7: SLIC List
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/24/2004
Date Data Arrived at EDR: 11/29/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 36

Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2008
Date Data Arrived at EDR: 04/03/2008
Date Made Active in Reports: 04/14/2008
Number of Days to Update: 11

Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-3298
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/10/2007
Date Data Arrived at EDR: 09/11/2007
Date Made Active in Reports: 09/28/2007
Number of Days to Update: 17

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Last EDR Contact: 08/08/2011
Next Scheduled EDR Contact: 11/21/2011
Data Release Frequency: Annually

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 01/28/2015
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 42

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/10/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 31

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 184

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 01/08/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 01/30/2015
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 32

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 29

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

UST: Active UST Facilities
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/26/2015
Number of Days to Update: 8

Source: SWRCB
Telephone: 916-341-5851
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Semi-Annually

AST: Aboveground Petroleum Storage Tank Facilities
A listing of aboveground storage tank petroleum storage tank locations.

Date of Government Version: 08/01/2009
Date Data Arrived at EDR: 09/10/2009
Date Made Active in Reports: 10/01/2009
Number of Days to Update: 21

Source: California Environmental Protection Agency
Telephone: 916-327-5092
Last EDR Contact: 07/13/2015
Next Scheduled EDR Contact: 04/13/2015
Data Release Frequency: Quarterly

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 01/27/2014
Number of Days to Update: 271

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 01/30/2015
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 36

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 01/29/2015
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 42

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 12/14/2014
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 29

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 01/12/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Varies

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 10/01/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 36

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 12/31/2014
Next Scheduled EDR Contact: 04/13/2015
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

VCP: Voluntary Cleanup Program Properties
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/12/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 6

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/12/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites
Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/22/2014
Date Data Arrived at EDR: 12/22/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 38

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 03/24/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: No Update Planned

SWRCY: Recycler Database
A listing of recycling facilities in California.

Date of Government Version: 03/16/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/26/2015
Number of Days to Update: 8

Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

HAULERS: Registered Waste Tire Haulers Listing
A listing of registered waste tire haulers.

Date of Government Version: 12/01/2014
Date Data Arrived at EDR: 12/01/2014
Date Made Active in Reports: 01/23/2015
Number of Days to Update: 53

Source: Integrated Waste Management Board
Telephone: 916-341-6422
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

WMUDS/SWAT: Waste Management Unit Database
Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/2000
Date Data Arrived at EDR: 04/10/2000
Date Made Active in Reports: 05/10/2000
Number of Days to Update: 30

Source: State Water Resources Control Board
Telephone: 916-227-4448
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: No Update Planned

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/03/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Quarterly

HIST CAL-SITES: Calsites Database

The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database. No longer updated by the state agency. It has been replaced by ENVIROSTOR.

Date of Government Version: 08/08/2005
Date Data Arrived at EDR: 08/03/2006
Date Made Active in Reports: 08/24/2006
Number of Days to Update: 21

Source: Department of Toxic Substance Control
Telephone: 916-323-3400
Last EDR Contact: 02/23/2009
Next Scheduled EDR Contact: 05/25/2009
Data Release Frequency: No Update Planned

SCH: School Property Evaluation Program

This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/12/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 6

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/12/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

TOXIC PITS: Toxic Pits Cleanup Act Sites

Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/1995
Date Data Arrived at EDR: 08/30/1995
Date Made Active in Reports: 09/26/1995
Number of Days to Update: 27

Source: State Water Resources Control Board
Telephone: 916-227-4364
Last EDR Contact: 01/26/2009
Next Scheduled EDR Contact: 04/27/2009
Data Release Frequency: No Update Planned

CDL: Clandestine Drug Labs

A listing of drug lab locations. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or does not require additional cleanup work.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 8

Source: Department of Toxic Substances Control
Telephone: 916-255-6504
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Varies

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/03/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: No Update Planned

Local Lists of Registered Storage Tanks

CA FID UST: Facility Inventory Database

The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/1994
Date Data Arrived at EDR: 09/05/1995
Date Made Active in Reports: 09/29/1995
Number of Days to Update: 24

Source: California Environmental Protection Agency
Telephone: 916-341-5851
Last EDR Contact: 12/28/1998
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

UST MENDOCINO: Mendocino County UST Database

A listing of underground storage tank locations in Mendocino County.

Date of Government Version: 09/23/2009
Date Data Arrived at EDR: 09/23/2009
Date Made Active in Reports: 10/01/2009
Number of Days to Update: 8

Source: Department of Public Health
Telephone: 707-463-4466
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Annually

HIST UST: Hazardous Substance Storage Container Database

The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/1990
Date Data Arrived at EDR: 01/25/1991
Date Made Active in Reports: 02/12/1991
Number of Days to Update: 18

Source: State Water Resources Control Board
Telephone: 916-341-5851
Last EDR Contact: 07/26/2001
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SWEEPS UST: SWEEPS UST Listing

Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

Date of Government Version: 06/01/1994
Date Data Arrived at EDR: 07/07/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/03/2005
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

LIENS: Environmental Liens Listing

A listing of property locations with environmental liens for California where DTSC is a lien holder.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/13/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 11

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

DEED: Deed Restriction Listing

Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners.

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 8

Source: DTSC and SWRCB
Telephone: 916-323-3400
Last EDR Contact: 03/10/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Semi-Annually

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 12/30/2014
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 69

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

CHMIRS: California Hazardous Material Incident Report System

California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 01/21/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 29

Source: Office of Emergency Services
Telephone: 916-845-8400
Last EDR Contact: 01/28/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

LDS: Land Disposal Sites Listing

The Land Disposal program regulates of waste discharge to land for treatment, storage and disposal in waste management units.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 6

Source: State Water Qualilty Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

MCS: Military Cleanup Sites Listing

The State Water Resources Control Board and nine Regional Water Quality Control Boards partner with the Department of Defense (DoD) through the Defense and State Memorandum of Agreement (DSMOA) to oversee the investigation and remediation of water quality issues at military facilities.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 6

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 06/06/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/22/2013
Number of Days to Update: 50

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 01/15/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 06/06/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 09/18/2014
Number of Days to Update: 8

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 24

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/10/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 02/27/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 12/30/2014
Date Data Arrived at EDR: 12/31/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 29

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/31/2013
Date Made Active in Reports: 09/13/2013
Number of Days to Update: 44

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 01/29/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 14

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/27/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 01/09/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 33

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 01/16/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 21

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 02/27/2015
Date Data Arrived at EDR: 02/27/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 26

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 02/27/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 01/18/2015
Date Data Arrived at EDR: 02/27/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 26

Source: EPA
Telephone: (415) 947-8000
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 04/19/2013
Number of Days to Update: 52

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 02/24/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Biennially

CA BOND EXP. PLAN: Bond Expenditure Plan

Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/1989
Date Data Arrived at EDR: 07/27/1994
Date Made Active in Reports: 08/02/1994
Number of Days to Update: 6

Source: Department of Health Services
Telephone: 916-255-2118
Last EDR Contact: 05/31/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

UIC: UIC Listing

A listing of wells identified as underground injection wells, in the California Oil and Gas Wells database.

Date of Government Version: 11/19/2014
Date Data Arrived at EDR: 12/15/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 45

Source: Deaprtment of Conservation
Telephone: 916-445-2408
Last EDR Contact: 03/20/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Varies

NPDES: NPDES Permits Listing
A listing of NPDES permits, including stormwater.

Date of Government Version: 03/12/2015
Date Data Arrived at EDR: 03/13/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 11

Source: State Water Resources Control Board
Telephone: 916-445-9379
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

CORTESE: "Cortese" Hazardous Waste & Substances Sites List
The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites).

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 36

Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-3400
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

HIST CORTESE: Hazardous Waste & Substance Site List
The sites for the list are designated by the State Water Resource Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES]. This listing is no longer updated by the state agency.

Date of Government Version: 04/01/2001
Date Data Arrived at EDR: 01/22/2009
Date Made Active in Reports: 04/08/2009
Number of Days to Update: 76

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/22/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

NOTIFY 65: Proposition 65 Records
Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

Date of Government Version: 10/21/1993
Date Data Arrived at EDR: 11/01/1993
Date Made Active in Reports: 11/19/1993
Number of Days to Update: 18

Source: State Water Resources Control Board
Telephone: 916-445-3846
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: No Update Planned

DRYCLEANERS: Cleaner Facilities
A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 02/18/2015
Date Data Arrived at EDR: 02/20/2015
Date Made Active in Reports: 03/12/2015
Number of Days to Update: 20

Source: Department of Toxic Substance Control
Telephone: 916-327-4498
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Annually

WIP: Well Investigation Program Case List
Well Investigation Program case in the San Gabriel and San Fernando Valley area.

Date of Government Version: 07/03/2009
Date Data Arrived at EDR: 07/21/2009
Date Made Active in Reports: 08/03/2009
Number of Days to Update: 13

Source: Los Angeles Water Quality Control Board
Telephone: 213-576-6726
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

ENF: Enforcement Action Listing

A listing of Water Board Enforcement Actions. Formal is everything except Oral/Verbal Communication, Notice of Violation, Expedited Payment Letter, and Staff Enforcement Letter.

Date of Government Version: 01/26/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 29

Source: State Water Resoruces Control Board
Telephone: 916-445-9379
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

HAZNET: Facility and Manifest Data

Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method. This database begins with calendar year 1993.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/19/2014
Number of Days to Update: 35

Source: California Environmental Protection Agency
Telephone: 916-255-1136
Last EDR Contact: 01/16/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Annually

EMI: Emissions Inventory Data

Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 03/25/2014
Date Made Active in Reports: 04/28/2014
Number of Days to Update: 34

Source: California Air Resources Board
Telephone: 916-322-2990
Last EDR Contact: 03/27/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Varies

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 01/15/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 02/18/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 01/15/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: N/A

WDS: Waste Discharge System
Sites which have been issued waste discharge requirements.

Date of Government Version: 06/19/2007
Date Data Arrived at EDR: 06/20/2007
Date Made Active in Reports: 06/29/2007
Number of Days to Update: 9

Source: State Water Resources Control Board
Telephone: 916-341-5227
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 10/17/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 3

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 02/13/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

LEAD SMELTER 2: Lead Smelter Sites
A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

LEAD SMELTER 1: Lead Smelter Sites
A listing of former lead smelter site locations.

Date of Government Version: 11/25/2014
Date Data Arrived at EDR: 11/26/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 01/05/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Varies

2020 COR ACTION: 2020 Corrective Action Program List
The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/13/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST
EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

PROC: Certified Processors Database
A listing of certified processors.

Date of Government Version: 03/16/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 6

Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

Financial Assurance 1: Financial Assurance Information Listing
Financial Assurance information

Date of Government Version: 02/02/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 25

Source: Department of Toxic Substances Control
Telephone: 916-255-3628
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

MWMP: Medical Waste Management Program Listing
The Medical Waste Management Program (MWMP) ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste Offsite Treatment Facilities (PDF) and Transfer Stations (PDF) throughout the state. MWMP also oversees all Medical Waste Transporters.

Date of Government Version: 01/16/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 8

Source: Department of Public Health
Telephone: 916-558-1784
Last EDR Contact: 03/10/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

COAL ASH DOE: Steam-Electric Plant Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 01/15/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Varies

HWT: Registered Hazardous Waste Transporter Database
A listing of hazardous waste transporters. In California, unless specifically exempted, it is unlawful for any person to transport hazardous wastes unless the person holds a valid registration issued by DTSC. A hazardous waste transporter registration is valid for one year and is assigned a unique registration number.

Date of Government Version: 01/12/2015
Date Data Arrived at EDR: 01/13/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 21

Source: Department of Toxic Substances Control
Telephone: 916-440-7145
Last EDR Contact: 01/13/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Quarterly

HWP: EnviroStor Permitted Facilities Listing
Detailed information on permitted hazardous waste facilities and corrective action ("cleanups") tracked in EnviroStor.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 7

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/24/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)
The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

Financial Assurance 2: Financial Assurance Information Listing
A listing of financial assurance information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 02/17/2015
Date Data Arrived at EDR: 02/20/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 11

Source: California Integrated Waste Management Board
Telephone: 916-341-6066
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Resources Recycling and Recovery in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/13/2014
Number of Days to Update: 196

Source: Department of Resources Recycling and Recovery
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the State Water Resources Control Board in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/30/2013
Number of Days to Update: 182

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

COUNTY RECORDS

ALAMEDA COUNTY:

Contaminated Sites

A listing of contaminated sites overseen by the Toxic Release Program (oil and groundwater contamination from chemical releases and spills) and the Leaking Underground Storage Tank Program (soil and ground water contamination from leaking petroleum USTs).

Date of Government Version: 01/21/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 29

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Semi-Annually

Underground Tanks

Underground storage tank sites located in Alameda county.

Date of Government Version: 01/21/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 29

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Semi-Annually

AMADOR COUNTY:

CUPA Facility List

Cupa Facility List

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/24/2015
Date Made Active in Reports: 03/31/2015
Number of Days to Update: 7

Source: Amador County Environmental Health
Telephone: 209-223-6439
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

BUTTE COUNTY:

CUPA Facility Listing

Cupa facility list.

Date of Government Version: 11/20/2014
Date Data Arrived at EDR: 11/24/2014
Date Made Active in Reports: 01/07/2015
Number of Days to Update: 44

Source: Public Health Department
Telephone: 530-538-7149
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: No Update Planned

CALVERAS COUNTY:

CUPA Facility Listing
Cupa Facility Listing

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/05/2015
Date Made Active in Reports: 03/10/2015
Number of Days to Update: 5

Source: Calveras County Environmental Health
Telephone: 209-754-6399
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

COLUSA COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 06/11/2014
Date Data Arrived at EDR: 06/13/2014
Date Made Active in Reports: 07/07/2014
Number of Days to Update: 24

Source: Health & Human Services
Telephone: 530-458-0396
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Varies

CONTRA COSTA COUNTY:

Site List
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/25/2015
Date Made Active in Reports: 03/04/2015
Number of Days to Update: 7

Source: Contra Costa Health Services Department
Telephone: 925-646-2286
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Semi-Annually

DEL NORTE COUNTY:

CUPA Facility List
Cupa Facility list

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/25/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 6

Source: Del Norte County Environmental Health Division
Telephone: 707-465-0426
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

EL DORADO COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 02/24/2015
Date Data Arrived at EDR: 02/25/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 6

Source: El Dorado County Environmental Management Department
Telephone: 530-621-6623
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

FRESNO COUNTY:

CUPA Resources List

Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 01/16/2015
Date Made Active in Reports: 02/05/2015
Number of Days to Update: 20

Source: Dept. of Community Health
Telephone: 559-445-3271
Last EDR Contact: 01/05/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Semi-Annually

HUMBOLDT COUNTY:

CUPA Facility List

CUPA facility list.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/13/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 11

Source: Humboldt County Environmental Health
Telephone: N/A
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

IMPERIAL COUNTY:

CUPA Facility List

Cupa facility list.

Date of Government Version: 02/10/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 19

Source: San Diego Border Field Office
Telephone: 760-339-2777
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INYO COUNTY:

CUPA Facility List

Cupa facility list.

Date of Government Version: 09/10/2013
Date Data Arrived at EDR: 09/11/2013
Date Made Active in Reports: 10/14/2013
Number of Days to Update: 33

Source: Inyo County Environmental Health Services
Telephone: 760-878-0238
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Kern County Sites and Tanks Listing.

Date of Government Version: 07/22/2014
Date Data Arrived at EDR: 11/12/2014
Date Made Active in Reports: 12/19/2014
Number of Days to Update: 37

Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

KINGS COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 11/21/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 12/30/2014
Number of Days to Update: 35

Source: Kings County Department of Public Health
Telephone: 559-584-1411
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

LAKE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 01/20/2015
Date Data Arrived at EDR: 01/21/2015
Date Made Active in Reports: 02/05/2015
Number of Days to Update: 15

Source: Lake County Environmental Health
Telephone: 707-263-1164
Last EDR Contact: 01/19/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Varies

LOS ANGELES COUNTY:

San Gabriel Valley Areas of Concern
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 03/30/2009
Date Data Arrived at EDR: 03/31/2009
Date Made Active in Reports: 10/23/2009
Number of Days to Update: 206

Source: EPA Region 9
Telephone: 415-972-3178
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: No Update Planned

HMS: Street Number List
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 11/24/2014
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/04/2015
Number of Days to Update: 33

Source: Department of Public Works
Telephone: 626-458-3517
Last EDR Contact: 01/12/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Semi-Annually

List of Solid Waste Facilities
Solid Waste Facilities in Los Angeles County.

Date of Government Version: 01/19/2015
Date Data Arrived at EDR: 01/20/2015
Date Made Active in Reports: 02/05/2015
Number of Days to Update: 16

Source: La County Department of Public Works
Telephone: 818-458-5185
Last EDR Contact: 01/20/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Varies

City of Los Angeles Landfills
Landfills owned and maintained by the City of Los Angeles.

Date of Government Version: 03/05/2009
Date Data Arrived at EDR: 03/10/2009
Date Made Active in Reports: 04/08/2009
Number of Days to Update: 29

Source: Engineering & Construction Division
Telephone: 213-473-7869
Last EDR Contact: 01/19/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Varies

Site Mitigation List
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 01/15/2015
Date Data Arrived at EDR: 01/29/2015
Date Made Active in Reports: 03/10/2015
Number of Days to Update: 40

Source: Community Health Services
Telephone: 323-890-7806
Last EDR Contact: 01/19/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Annually

City of El Segundo Underground Storage Tank
Underground storage tank sites located in El Segundo city.

Date of Government Version: 10/20/2014
Date Data Arrived at EDR: 10/22/2014
Date Made Active in Reports: 12/15/2014
Number of Days to Update: 54

Source: City of El Segundo Fire Department
Telephone: 310-524-2236
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Semi-Annually

City of Long Beach Underground Storage Tank
Underground storage tank sites located in the city of Long Beach.

Date of Government Version: 01/29/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 13

Source: City of Long Beach Fire Department
Telephone: 562-570-2563
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Annually

City of Torrance Underground Storage Tank
Underground storage tank sites located in the city of Torrance.

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/27/2015
Number of Days to Update: 12

Source: City of Torrance Fire Department
Telephone: 310-618-2973
Last EDR Contact: 01/12/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Semi-Annually

MADERA COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 03/20/2015
Date Data Arrived at EDR: 03/24/2015
Date Made Active in Reports: 03/31/2015
Number of Days to Update: 7

Source: Madera County Environmental Health
Telephone: 559-675-7823
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

MARIN COUNTY:

Underground Storage Tank Sites
Currently permitted USTs in Marin County.

Date of Government Version: 10/08/2014
Date Data Arrived at EDR: 10/22/2014
Date Made Active in Reports: 12/15/2014
Number of Days to Update: 54

Source: Public Works Department Waste Management
Telephone: 415-499-6647
Last EDR Contact: 01/05/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Semi-Annually

MERCED COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 7

Source: Merced County Environmental Health
Telephone: 209-381-1094
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

MONO COUNTY:

CUPA Facility List
CUPA Facility List

Date of Government Version: 02/27/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/10/2015
Number of Days to Update: 4

Source: Mono County Health Department
Telephone: 760-932-5580
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Varies

MONTEREY COUNTY:

CUPA Facility Listing
CUPA Program listing from the Environmental Health Division.

Date of Government Version: 03/19/2015
Date Data Arrived at EDR: 03/20/2015
Date Made Active in Reports: 03/31/2015
Number of Days to Update: 11

Source: Monterey County Health Department
Telephone: 831-796-1297
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

NAPA COUNTY:

Sites With Reported Contamination
A listing of leaking underground storage tank sites located in Napa county.

Date of Government Version: 12/05/2011
Date Data Arrived at EDR: 12/06/2011
Date Made Active in Reports: 02/07/2012
Number of Days to Update: 63

Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: No Update Planned

Closed and Operating Underground Storage Tank Sites
Underground storage tank sites located in Napa county.

Date of Government Version: 01/15/2008
Date Data Arrived at EDR: 01/16/2008
Date Made Active in Reports: 02/08/2008
Number of Days to Update: 23

Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: No Update Planned

NEVADA COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 02/12/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 18

Source: Community Development Agency
Telephone: 530-265-1467
Last EDR Contact: 02/06/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

ORANGE COUNTY:

List of Industrial Site Cleanups
Petroleum and non-petroleum spills.

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 18

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Annually

List of Underground Storage Tank Cleanups
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 18

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

List of Underground Storage Tank Facilities
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 13

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

PLACER COUNTY:

Master List of Facilities
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/12/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 6

Source: Placer County Health and Human Services
Telephone: 530-745-2363
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Semi-Annually

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 01/28/2015
Date Data Arrived at EDR: 01/29/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 33

Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Quarterly

Underground Storage Tank Tank List
Underground storage tank sites located in Riverside county.

Date of Government Version: 01/28/2015
Date Data Arrived at EDR: 01/29/2015
Date Made Active in Reports: 02/26/2015
Number of Days to Update: 28

Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Quarterly

SACRAMENTO COUNTY:

Toxic Site Clean-Up List
List of sites where unauthorized releases of potentially hazardous materials have occurred.

Date of Government Version: 11/03/2014
Date Data Arrived at EDR: 01/07/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 27

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 01/07/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Quarterly

Master Hazardous Materials Facility List
Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 11/03/2014
Date Data Arrived at EDR: 01/09/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 25

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 01/05/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Quarterly

SAN BERNARDINO COUNTY:

Hazardous Material Permits
This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 03/02/2015
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/10/2015
Number of Days to Update: 7

Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

SAN DIEGO COUNTY:

Hazardous Materials Management Division Database

The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 09/23/2013
Date Data Arrived at EDR: 09/24/2013
Date Made Active in Reports: 10/17/2013
Number of Days to Update: 23

Source: Hazardous Materials Management Division
Telephone: 619-338-2268
Last EDR Contact: 03/10/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Quarterly

Solid Waste Facilities

San Diego County Solid Waste Facilities.

Date of Government Version: 10/31/2014
Date Data Arrived at EDR: 11/21/2014
Date Made Active in Reports: 12/29/2014
Number of Days to Update: 38

Source: Department of Health Services
Telephone: 619-338-2209
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

Environmental Case Listing

The listing contains all underground tank release cases and projects pertaining to properties contaminated with hazardous substances that are actively under review by the Site Assessment and Mitigation Program.

Date of Government Version: 03/23/2010
Date Data Arrived at EDR: 06/15/2010
Date Made Active in Reports: 07/09/2010
Number of Days to Update: 24

Source: San Diego County Department of Environmental Health
Telephone: 619-338-2371
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: No Update Planned

SAN FRANCISCO COUNTY:

Local Oversite Facilities

A listing of leaking underground storage tank sites located in San Francisco county.

Date of Government Version: 09/19/2008
Date Data Arrived at EDR: 09/19/2008
Date Made Active in Reports: 09/29/2008
Number of Days to Update: 10

Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

Underground Storage Tank Information

Underground storage tank sites located in San Francisco county.

Date of Government Version: 11/29/2010
Date Data Arrived at EDR: 03/10/2011
Date Made Active in Reports: 03/15/2011
Number of Days to Update: 5

Source: Department of Public Health
Telephone: 415-252-3920
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

SAN JOAQUIN COUNTY:

San Joaquin Co. UST
A listing of underground storage tank locations in San Joaquin county.

Date of Government Version: 03/24/2015
Date Data Arrived at EDR: 03/25/2015
Date Made Active in Reports: 03/31/2015
Number of Days to Update: 6

Source: Environmental Health Department
Telephone: N/A
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Semi-Annually

SAN LUIS OBISPO COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 7

Source: San Luis Obispo County Public Health Department
Telephone: 805-781-5596
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

SAN MATEO COUNTY:

Business Inventory
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 01/09/2015
Date Data Arrived at EDR: 01/12/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 22

Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 03/16/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Annually

Fuel Leak List
A listing of leaking underground storage tank sites located in San Mateo county.

Date of Government Version: 03/16/2015
Date Data Arrived at EDR: 03/17/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 7

Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Semi-Annually

SANTA BARBARA COUNTY:

CUPA Facility Listing
CUPA Program Listing from the Environmental Health Services division.

Date of Government Version: 09/08/2011
Date Data Arrived at EDR: 09/09/2011
Date Made Active in Reports: 10/07/2011
Number of Days to Update: 28

Source: Santa Barbara County Public Health Department
Telephone: 805-686-8167
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

SANTA CLARA COUNTY:

Cupa Facility List
Cupa facility list

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/25/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 6

Source: Department of Environmental Health
Telephone: 408-918-1973
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

HIST LUST - Fuel Leak Site Activity Report

A listing of open and closed leaking underground storage tanks. This listing is no longer updated by the county. Leaking underground storage tanks are now handled by the Department of Environmental Health.

Date of Government Version: 03/29/2005
Date Data Arrived at EDR: 03/30/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 22

Source: Santa Clara Valley Water District
Telephone: 408-265-2600
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

LOP Listing

A listing of leaking underground storage tanks located in Santa Clara county.

Date of Government Version: 03/03/2014
Date Data Arrived at EDR: 03/05/2014
Date Made Active in Reports: 03/18/2014
Number of Days to Update: 13

Source: Department of Environmental Health
Telephone: 408-918-3417
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Annually

Hazardous Material Facilities

Hazardous material facilities, including underground storage tank sites.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/04/2015
Number of Days to Update: 8

Source: City of San Jose Fire Department
Telephone: 408-535-7694
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Annually

SANTA CRUZ COUNTY:

CUPA Facility List

CUPA facility listing.

Date of Government Version: 11/24/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 12/31/2014
Number of Days to Update: 36

Source: Santa Cruz County Environmental Health
Telephone: 831-464-2761
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

SHASTA COUNTY:

CUPA Facility List

Cupa Facility List.

Date of Government Version: 03/11/2015
Date Data Arrived at EDR: 03/13/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 11

Source: Shasta County Department of Resource Management
Telephone: 530-225-5789
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

SOLANO COUNTY:

Leaking Underground Storage Tanks
A listing of leaking underground storage tank sites located in Solano county.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/19/2015
Date Made Active in Reports: 03/24/2015
Number of Days to Update: 5

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

Underground Storage Tanks
Underground storage tank sites located in Solano county.

Date of Government Version: 03/13/2015
Date Data Arrived at EDR: 03/20/2015
Date Made Active in Reports: 03/31/2015
Number of Days to Update: 11

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

SONOMA COUNTY:

Cupa Facility List
Cupa Facility list

Date of Government Version: 01/06/2015
Date Data Arrived at EDR: 01/09/2015
Date Made Active in Reports: 02/05/2015
Number of Days to Update: 27

Source: County of Sonoma Fire & Emergency Services Department
Telephone: 707-565-1174
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

Leaking Underground Storage Tank Sites
A listing of leaking underground storage tank sites located in Sonoma county.

Date of Government Version: 01/02/2015
Date Data Arrived at EDR: 01/06/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 28

Source: Department of Health Services
Telephone: 707-565-6565
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

SUTTER COUNTY:

Underground Storage Tanks
Underground storage tank sites located in Sutter county.

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/18/2015
Number of Days to Update: 8

Source: Sutter County Department of Agriculture
Telephone: 530-822-7500
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Semi-Annually

TUOLUMNE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 01/30/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/27/2015
Number of Days to Update: 24

Source: Divison of Environmental Health
Telephone: 209-533-5633
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

VENTURA COUNTY:

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks

The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 01/27/2015
Date Data Arrived at EDR: 02/19/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 12

Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

Inventory of Illegal Abandoned and Inactive Sites

Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 12/01/2011
Date Made Active in Reports: 01/19/2012
Number of Days to Update: 49

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 01/05/2015
Next Scheduled EDR Contact: 04/20/2015
Data Release Frequency: Annually

Listing of Underground Tank Cleanup Sites

Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 05/29/2008
Date Data Arrived at EDR: 06/24/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 37

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

Medical Waste Program List

To protect public health and safety and the environment from potential exposure to disease causing agents, the Environmental Health Division Medical Waste Program regulates the generation, handling, storage, treatment and disposal of medical waste throughout the County.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 32

Source: Ventura County Resource Management Agency
Telephone: 805-654-2813
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

Underground Tank Closed Sites List

Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 02/27/2015
Date Data Arrived at EDR: 03/18/2015
Date Made Active in Reports: 03/26/2015
Number of Days to Update: 8

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 03/18/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Quarterly

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report

Underground storage tank sites located in Yolo county.

Date of Government Version: 12/18/2014
Date Data Arrived at EDR: 12/23/2014
Date Made Active in Reports: 01/27/2015
Number of Days to Update: 35

Source: Yolo County Department of Health
Telephone: 530-666-8646
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Annually

YUBA COUNTY:

CUPA Facility List
CUPA facility listing for Yuba County.

Date of Government Version: 02/17/2015
Date Data Arrived at EDR: 02/19/2015
Date Made Active in Reports: 03/03/2015
Number of Days to Update: 12

Source: Yuba County Environmental Health Department
Telephone: 530-749-7523
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data
Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 07/30/2013
Date Data Arrived at EDR: 08/19/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 45

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/17/2014
Next Scheduled EDR Contact: 03/02/2015
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/19/2012
Date Made Active in Reports: 08/28/2012
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 01/12/2015
Next Scheduled EDR Contact: 04/27/2015
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 01/01/2015
Date Data Arrived at EDR: 02/04/2015
Date Made Active in Reports: 02/27/2015
Number of Days to Update: 23

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 02/04/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/21/2014
Date Made Active in Reports: 08/25/2014
Number of Days to Update: 35

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 01/19/2015
Next Scheduled EDR Contact: 05/04/2015
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/15/2014
Date Made Active in Reports: 08/13/2014
Number of Days to Update: 29

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 06/20/2014
Date Made Active in Reports: 08/07/2014
Number of Days to Update: 48

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

APM HOMES, INC
2574-2842 AND 2862 LINWOOD AVENUE
SANTA ROSA, CA 95404

TARGET PROPERTY COORDINATES

Latitude (North):	38.4221 - 38˚ 25' 19.56''
Longitude (West):	122.6922 - 122˚ 41' 31.92''
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	526869.1
UTM Y (Meters):	4252488.0
Elevation:	253 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	38122-D6 SANTA ROSA, CA
Most Recent Revision:	1999

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

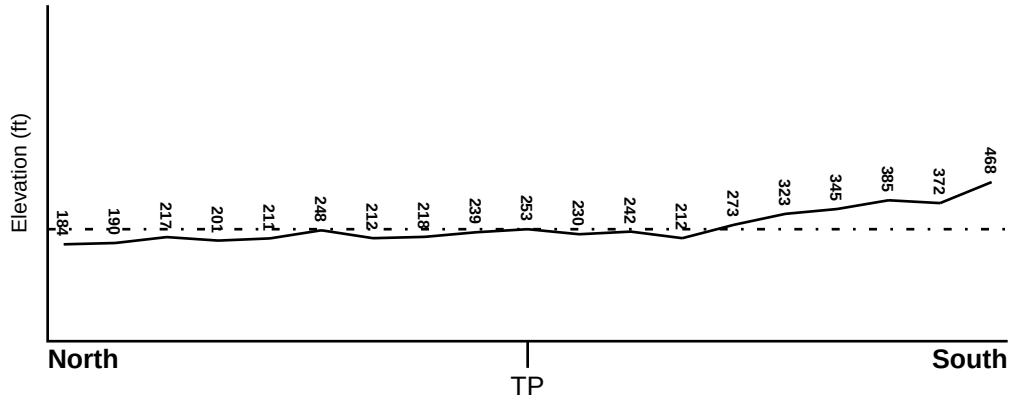
TOPOGRAPHIC INFORMATION

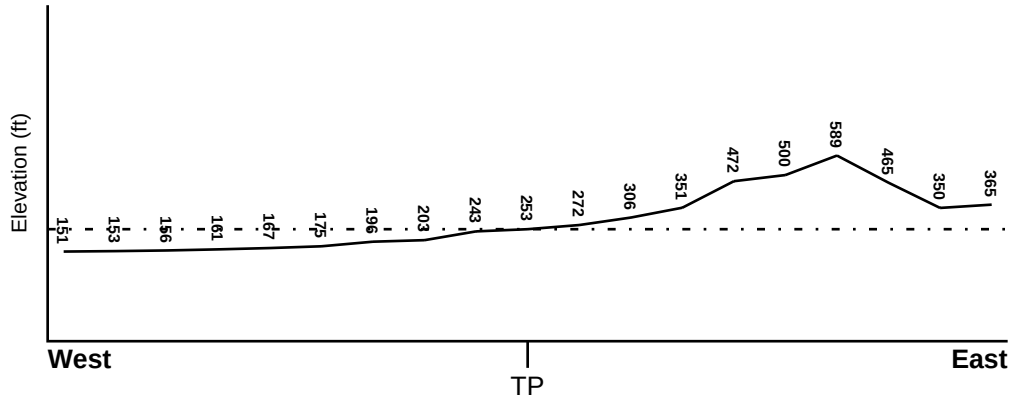
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General West

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 253 ft.

0 1/2 1 Miles

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
SONOMA, CA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 06097C - FEMA DFIRM Flood data

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
SANTA ROSA	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius: 1.25 miles
Status: Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
3	1/2 - 1 Mile West	SSW

For additional site information, refer to Physical Setting Source Map Findings.

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

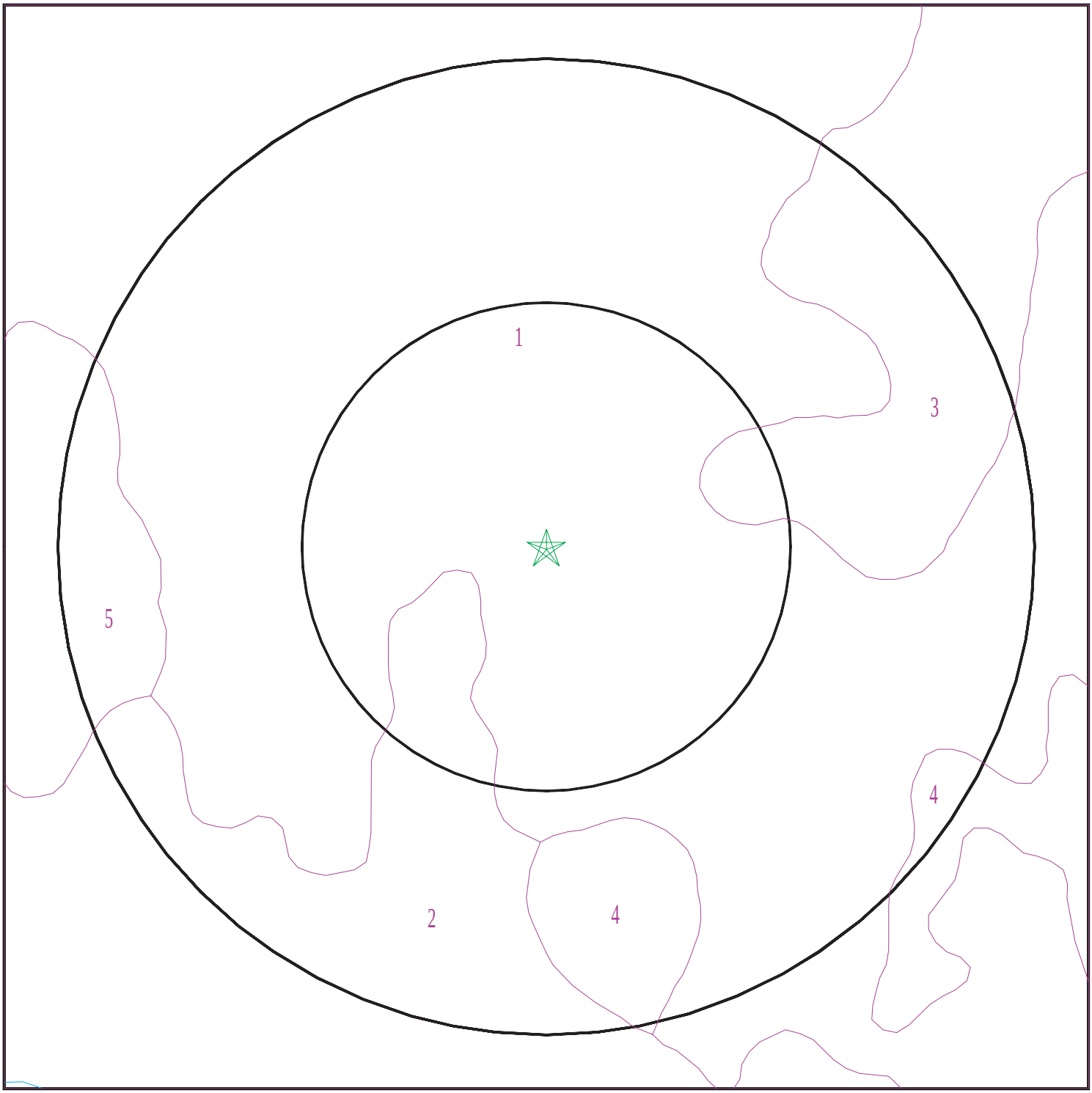
Era:	Cenozoic
System:	Tertiary
Series:	Pliocene volcanic rocks
Code:	Tpv *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Volcanic Rocks

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 4251606.2s



Target Property
SSURGO Soil
Water

0 1/16 1/8 1/4 Miles

N

SITE NAME:	APM Homes, Inc	CLIENT:	Harris & Lee Env. Sciences
ADDRESS:	2574-2842 and 2862 Linwood Avenue Santa Rosa CA 95404	CONTACT:	Cathy Neumann
LAT/LONG:	38.4221 / 122.6922	INQUIRY #:	4251606.2s
		DATE:	April 01, 2015 4:22 pm

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: RAYNOR

Soil Surface Texture: clay

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 127 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	16 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 7.3 Min: 6.1
2	16 inches	46 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
3	46 inches	55 inches	very cobbly clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
4	55 inches	59 inches	fragmental material	Not reported	Not reported	Max: Min:	Max: Min:

Soil Map ID: 2

Soil Component Name: CLEAR LAKE

Soil Surface Texture: clay

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	38 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 7.3 Min: 5.6
2	38 inches	59 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4

Soil Map ID: 3

Soil Component Name: RAYNOR

Soil Surface Texture: clay

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Well drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 77 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	16 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 7.3 Min: 6.1
2	16 inches	35 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
3	35 inches	44 inches	very cobbly clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
4	44 inches	59 inches	fragmental material	Not reported	Not reported	Max: Min:	Max: Min:

Soil Map ID: 4

Soil Component Name: GOULDING

Soil Surface Texture: cobbly clay loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 36 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	cobbly clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 14 Min: 4	Max: 6.5 Min: 5.6
2	9 inches	18 inches	very gravelly clay loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Gravels, Gravels with fines, Clayey Gravel	Max: 14 Min: 4	Max: 6.5 Min: 6.1
3	18 inches	22 inches	unweathered bedrock	Not reported	Not reported	Max: Min:	Max: Min:

Soil Map ID: 5

Soil Component Name: HAIRE

Soil Surface Texture: clay loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Moderately well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 4 Min: 1.4	Max: 7.3 Min: 6.1

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
2	14 inches	27 inches	clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 1.4 Min: 0.42	Max: 6 Min: 5.1
3	27 inches	59 inches	cobbly clay loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Gravels, Gravels with fines, Clayey Gravel	Max: 1.4 Min: 0.42	Max: 5.5 Min: 5.1

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

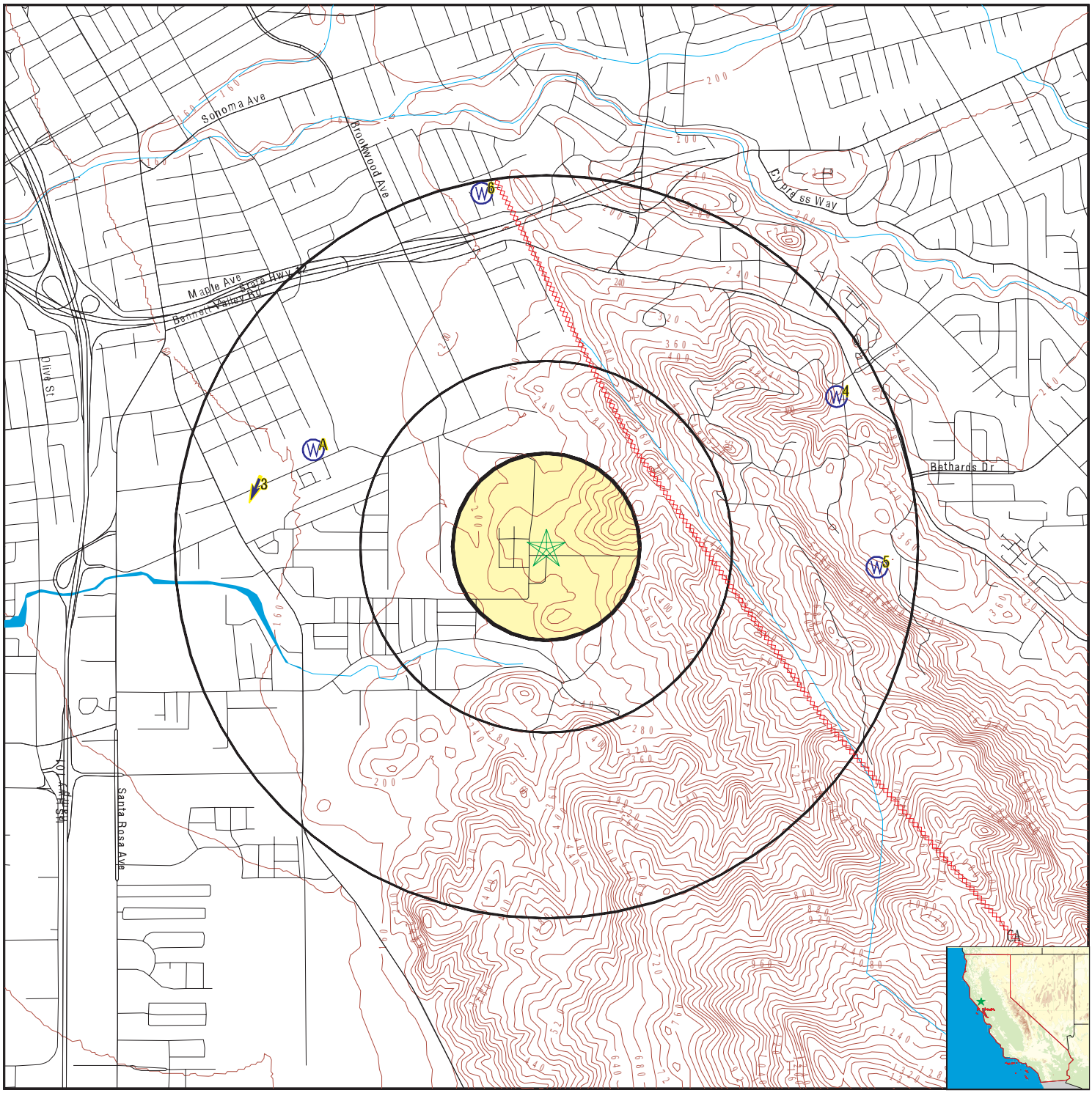
Note: PWS System location is not always the same as well location.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A1	7411	1/2 - 1 Mile WNW
A2	7410	1/2 - 1 Mile WNW
4	7388	1/2 - 1 Mile ENE
5	7389	1/2 - 1 Mile East
6	CADW50000031690	1/2 - 1 Mile North

PHYSICAL SETTING SOURCE MAP - 4251606.2s



0 1/4 1/2 1 Miles

- County Boundary
- Major Roads
- Contour Lines
- Earthquake Fault Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location
- HD Closest Hydrogeological Data
- Oil, gas or related wells

N

SITE NAME:	APM Homes, Inc	CLIENT:	Harris & Lee Env. Sciences
ADDRESS:	2574-2842 and 2862 Linwood Avenue Santa Rosa CA 95404	CONTACT:	Cathy Neumann
LAT/LONG:	38.4221 / 122.6922	INQUIRY #:	4251606.2s
		DATE:	April 01, 2015 4:22 pm

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Map ID Direction Distance Elevation	Database	EDR ID Number
A1 **WNW** **1/2 - 1 Mile** **Lower**	**CA WELLS**	**7411**

Water System Information:

Prime Station Code:	07N/08W-25E05 M	User ID:	RXR
FRDS Number:	4900926001	County:	Sonoma
District Number:	03	Station Type:	WELL/AMBNT/MUN/INTAKE
Water Type:	Well/Groundwater	Well Status:	Active Untreated
Source Lat/Long:	382534.0 1224208.0	Precision:	10 Feet (1/10 Second)
Source Name:	WELL 01		
System Number:	4900926		
System Name:	ASTON AVENUE APARTMENTS		
Organization That Operates System:			
	P.O. BOX 54		
	SANTA ROSA, CA 95401		
Pop Served:	36	Connections:	9
Area Served:	Not Reported		

A2 **WNW** **1/2 - 1 Mile** **Lower**	**CA WELLS**	**7410**

Water System Information:

Prime Station Code:	07N/08W-25E03 M	User ID:	RXR
FRDS Number:	4900927001	County:	Sonoma
District Number:	03	Station Type:	WELL/AMBNT/MUN/INTAKE
Water Type:	Well/Groundwater	Well Status:	Active Untreated
Source Lat/Long:	382533.0 1224211.0	Precision:	10 Feet (1/10 Second)
Source Name:	WELL 01		
System Number:	4900927		
System Name:	APARTMENTS 939-963 ASTON		
Organization That Operates System:			
	945 ASTON AVE.		
	SANTA ROSA, CA 95404		
Pop Served:	45	Connections:	13
Area Served:	Not Reported		

---

3 **West** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	Not Reported SSW Not Reported Not Reported Not Reported 10/30/1994	**AQUIFLOW**	**70985**

---

4 **ENE** **1/2 - 1 Mile** **Higher**	**CA WELLS**	**7388**

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Water System Information:

Prime Station Code:	07N/07W-30C04 M	User ID:	RXR
FRDS Number:	4900548001	County:	Sonoma
District Number:	03	Station Type:	WELL/AMBNT/MUN/INTAKE
Water Type:	Well/Groundwater	Well Status:	Active Raw
Source Lat/Long:	382541.0 1224036.0	Precision:	100 Feet (one Second)
Source Name:	WELL 01		
System Number:	4900548		
System Name:	Holland Heights Mutual Water Company		
Organization That Operates System:			
	P.O. BOX 9171		
	SANTA ROSA, CA 95405		
Pop Served:	500	Connections:	115
Area Served:	Not Reported		
Sample Collected:	27-SEP-10	Findings:	21. UG/L
Chemical:	MANGANESE		
Sample Collected:	13-SEP-11	Findings:	5. UNITS
Chemical:	COLOR		
Sample Collected:	13-SEP-11	Findings:	3. TON
Chemical:	ODOR THRESHOLD @ 60 C		
Sample Collected:	13-SEP-11	Findings:	460. US
Chemical:	SPECIFIC CONDUCTANCE		
Sample Collected:	13-SEP-11	Findings:	7.9
Chemical:	PH, LABORATORY		
Sample Collected:	13-SEP-11	Findings:	220. MG/L
Chemical:	ALKALINITY (TOTAL) AS CACO3		
Sample Collected:	13-SEP-11	Findings:	260. MG/L
Chemical:	BICARBONATE ALKALINITY		
Sample Collected:	13-SEP-11	Findings:	170. MG/L
Chemical:	HARDNESS (TOTAL) AS CACO3		
Sample Collected:	13-SEP-11	Findings:	30. MG/L
Chemical:	CALCIUM		
Sample Collected:	13-SEP-11	Findings:	24. MG/L
Chemical:	MAGNESIUM		
Sample Collected:	13-SEP-11	Findings:	25. MG/L
Chemical:	SODIUM		
Sample Collected:	13-SEP-11	Findings:	18. MG/L
Chemical:	CHLORIDE		
Sample Collected:	13-SEP-11	Findings:	0.23 MG/L
Chemical:	FLUORIDE (F) (NATURAL-SOURCE)		
Sample Collected:	13-SEP-11	Findings:	130. UG/L
Chemical:	IRON		
Sample Collected:	13-SEP-11	Findings:	320. MG/L
Chemical:	TOTAL DISSOLVED SOLIDS		
Sample Collected:	13-SEP-11	Findings:	0.35 NTU
Chemical:	TURBIDITY, LABORATORY		

Sample Collected:	13-SEP-11	Findings:	12.
Chemical:	AGGRSSIVE INDEX (CORROSIVITY)		
Sample Collected:	05-JUN-12	Findings:	220. UG/L
Chemical:	IRON		

5
East **CA WELLS** **7389**
1/2 - 1 Mile
Higher

Water System Information:

Prime Station Code:	07N/07W-30L01 M	User ID:	RXR
FRDS Number:	4900895001	County:	Sonoma
District Number:	03	Station Type:	WELL/AMBNT/MUN/INTAKE
Water Type:	Well/Groundwater	Well Status:	Active Untreated
Source Lat/Long:	382517.0 1224029.0	Precision:	10 Feet (1/10 Second)
Source Name:	WELL 01		
System Number:	4900895		
System Name:	WILLIAM AHL		
Organization That Operates System:			
	P.O. BOX 3		
	SANTA ROSA, CA 95402		
Pop Served:	48	Connections:	12
Area Served:	AHL;S BENNET VALLEY WATER CO		

6
North **CA WELLS** **CADW50000031690**
1/2 - 1 Mile
Lower

Latitude :	38.4359		
Longitude :	122.6954		
Site code:	384359N1226954W001	Casgem sta:	07N08W24L001M
Local well:	Not Reported	Casgem s 1:	Residential
County id:	49		
Basin cd:	1-55.01	Basin desc:	Santa Rosa Plain
Org unit n:	North Central Region Office	Site id:	CADW50000031690

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Zipcode	Num Tests	> 4 pCi/L
95404	20	1

Federal EPA Radon Zone for SONOMA County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for Zip Code: 95404

Number of sites tested: 3

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.467 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

OTHER STATE DATABASE INFORMATION

RADON

State Database: CA Radon
Source: Department of Health Services
Telephone: 916-324-2208
Radon Database for California

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

California Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional information (also from 1975) regarding activity at specific fault lines comes from California's Preliminary Fault Activity Map prepared by the California Division of Mines and Geology.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION

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APM Homes, Inc
2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

Inquiry Number: 4251606.3
April 01, 2015

Certified Sanborn® Map Report

6 Armstrong Road, 4th Floor
Shelton, Connecticut 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

4/01/15

Site Name:
APM Homes, Inc
2574-2842 and 2862 Linwood
Santa Rosa, CA 95404

Client Name:
Harris & Lee Env. Sciences
120 Ross Valley Drive
San Rafael, CA 94901-0000

EDR Inquiry # 4251606.3

Contact: Cathy Neumann

The Sanborn Library has been searched by EDR and maps covering the target property location as provided by Harris & Lee Env. Sciences were identified for the years listed below. The Sanborn Library is the largest, most complete collection of fire insurance maps. The collection includes maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow, and others. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by the Sanborn Library LLC, the copyright holder for the collection. Results can be authenticated by visiting www.edrnet.com/sanborn.

The Sanborn Library is continually enhanced with newly identified map archives. This report accesses all maps in the collection as of the day this report was generated.

Certified Sanborn Results:

Site Name: APM Homes, Inc
Address: 2574-2842 and 2862 Linwood Avenue
City, State, Zip: Santa Rosa, CA 95404
Cross Street:
P.O. # 2574-2842 and 2862 Linwood Ave
Project: APM Homes, Inc
Certification # EE28-4E3A-A0FA

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results
Certification # EE28-4E3A-A0FA

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✔ Library of Congress
- ✔ University Publications of America
- ✔ EDR Private Collection

The Sanborn Library LLC Since 1866™

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APM Homes, Inc
2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

Inquiry Number: 4251606.5
April 03, 2015

The EDR-City Directory Abstract

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION

Executive Summary

Findings

City Directory Images

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Abstract includes a search and abstract of available city directory data. For each address, the directory lists the name of the corresponding occupant at five year intervals.

Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 1930 through 2013. This report compiles information gathered in this review by geocoding the latitude and longitude of properties identified and gathering information about properties within 660 feet of the target property.

A summary of the information obtained is provided in the text of this report.

RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. An "X" indicates where information was identified in the source and provided in this report.

Year	Source	TP	Adjoining	Text Abstract	Source Image
2013	Cole Information Services	-	-	-	-
2008	Cole Information Services	-	-	-	-
2006	AT & T Yellow Pages	-	X	X	-
1994	Pacific Bell	-	X	X	-
	Pacific Bell	X	X	X	-
1990	R. L. Polk Co. Publishers	-	X	X	-
	R. L. Polk Co. Publishers	X	X	X	-
1987	R. L. Polk Co. Publishers	-	X	X	-
	R. L. Polk Co. Publishers	X	X	X	-
1981	The Pacific Telephone and Telegraph Company	-	X	X	-
	The Pacific Telephone and Telegraph Company	X	X	X	-
1976	R. L. Polk Co. Publishers	-	X	X	-
	R. L. Polk Co. Publishers	X	X	X	-
1970	R. L. Polk Co. Publishers	-	X	X	-
	R. L. Polk Co. Publishers	X	X	X	-
1965	R. L. Polk Co. Publishers	-	X	X	-
	R. L. Polk Co. Publishers	X	X	X	-
1961	R. L. Polk Co., Publishers	-	X	X	-
	R. L. Polk Co., Publishers	X	X	X	-
1958	R. L. Polk Co., Publishers	-	X	X	-
1953	R. L. Polk Co., Publishers	-	-	-	-
1947	R. L. Polk Co., Publishers	-	-	-	-
1935	R. L. Polk Co., Publishers	-	-	-	-
1930	R. L. Polk Co., of California Publishers	-	-	-	-

EXECUTIVE SUMMARY

SELECTED ADDRESSES

The following addresses were selected by the client, for EDR to research. An "X" indicates where information was identified.

Address	***Type***	***Findings***
2842 Linwood Avenue	Client Entered	X
2862 Linwood Avenue	Client Entered	X

FINDINGS

TARGET PROPERTY INFORMATION

ADDRESS

2574-2842 and 2862 Linwood Avenue
Santa Rosa, CA 95404

FINDINGS DETAIL

Target Property research detail.

LINWOOD AVE

2574 LINWOOD AVE

Year	Uses	Source
1990	Nelson Michi	R. L. Polk Co. Publishers
	Nelsons Auto & Truck Repair	R. L. Polk Co. Publishers
1987	Nelson Michl	R. L. Polk Co. Publishers
	Nelsons Auto & Truck Repair	R. L. Polk Co. Publishers
1981	Grieshaber Allen	The Pacific Telephone and Telegraph Company
1976	Dye Robt E	R. L. Polk Co. Publishers
1970	Housel R C	R. L. Polk Co. Publishers

2578 LINWOOD AVE

Year	Uses	Source
1994	Leahy Andrew	Pacific Bell
1990	Me Intosh Todd	R. L. Polk Co. Publishers
1987	Mc Intosh Todd	R. L. Polk Co. Publishers
1976	Zemmermnan Vernon C	R. L. Polk Co. Publishers

2636 LINWOOD AVE

Year	Uses	Source
1965	Haley E D	R. L. Polk Co. Publishers

2662 LINWOOD AVE

Year	Uses	Source
1965	Jones Wm E	R. L. Polk Co. Publishers
1961	Vacant	R. L. Polk Co., Publishers

FINDINGS

Linwood Avenue

2842 Linwood Avenue

Year	*Uses*	*Source*
1990	No Return	R. L. Polk Co. Publishers
1987	No Return	R. L. Polk Co. Publishers
1981	Wolcott Dennis P	The Pacific Telephone and Telegraph Company
1976	Vacant	R. L. Polk Co. Publishers

2862 Linwood Avenue

Year	*Uses*	*Source*
1990	Adams L G	R. L. Polk Co. Publishers
1976	Self Cecil N	R. L. Polk Co. Publishers
1970	Self Cecil N	R. L. Polk Co. Publishers

FINDINGS

ADJOINING PROPERTY DETAIL

The following Adjoining Property addresses were researched for this report. Detailed findings are provided for each address.

LINWOOD AVE

2525 LINWOOD AVE

Year	Uses	Source
1970	Chambers Geo A	R. L. Polk Co. Publishers

2533 LINWOOD AVE

Year	Uses	Source
1994	Halverson Donald B	Pacific Bell
1990	Halverson Donald B	R. L. Polk Co. Publishers
1987	Halverson Donald B	R. L. Polk Co. Publishers
1981	Hatlverson Donald B	The Pacific Telephone and Telegraph Company
	Halverson Donn	The Pacific Telephone and Telegraph Company
1976	Halverson Donald B	R. L. Polk Co. Publishers
1970	No Return	R. L. Polk Co. Publishers
1965	Ohman Philip J	R. L. Polk Co. Publishers
1961	Ohman Phillip J	R. L. Polk Co., Publishers
1958	Ohman Phillip J	R. L. Polk Co., Publishers

2549 LINWOOD AVE

Year	Uses	Source
1990	Cook Kenneth F	R. L. Polk Co. Publishers
1987	Cook Kenneth F	R. L. Polk Co. Publishers
1981	Cook Kenneth	The Pacific Telephone and Telegraph Company
	Cook Janelle & Jerry	The Pacific Telephone and Telegraph Company
1976	Cook Kenneth F	R. L. Polk Co. Publishers
1970	Cook Kenneth F	R. L. Polk Co. Publishers

2550 LINWOOD AVE

Year	Uses	Source
1961	Siri Julius B	R. L. Polk Co., Publishers
1958	Siri Julius B	R. L. Polk Co., Publishers

FINDINGS

2551 LINWOOD AVE

Year	Uses	Source
1958	Long Eulalia	R. L. Polk Co., Publishers

2552 LINWOOD AVE

Year	Uses	Source
1990	Weinstein Pamela	R. L. Polk Co. Publishers
1987	No Return	R. L. Polk Co. Publishers
1976	Smith Kevin D	R. L. Polk Co. Publishers
1970	Charles Bill B	R. L. Polk Co. Publishers
1965	Wilson Ceo R	R. L. Polk Co. Publishers

2555 LINWOOD AVE

Year	Uses	Source
1990	Benson Robt C	R. L. Polk Co. Publishers
1987	Benson Robt C	R. L. Polk Co. Publishers
1981	Soderlund John E	The Pacific Telephone and Telegraph Company
1976	Long Eula Mrs	R. L. Polk Co. Publishers
1970	Long Eulalia Mrs	R. L. Polk Co. Publishers
1965	Long Eulalia Mrs	R. L. Polk Co. Publishers
1961	Long Eulalia Mrs	R. L. Polk Co., Publishers

2564 LINWOOD AVE

Year	Uses	Source
1990	Hayes Jim	R. L. Polk Co. Publishers
1987	Vacant	R. L. Polk Co. Publishers
1976	Me Clendon Barney	R. L. Polk Co. Publishers
1970	Littlejohn Robt	R. L. Polk Co. Publishers
1965	Weare Wm N	R. L. Polk Co. Publishers

2567 LINWOOD AVE

Year	Uses	Source
1958	Vacant	R. L. Polk Co., Publishers

2569 LINWOOD AVE

Year	Uses	Source
1958	Vacant	R. L. Polk Co., Publishers

2572 LINWOOD AVE

Year	Uses	Source
1965	Under Constn	R. L. Polk Co. Publishers

FINDINGS

2595 LINWOOD AVE

Year	Uses	Source
1990	Mac Arthur Joan	R. L. Polk Co. Publishers
1987	Mac Arthur Richard	R. L. Polk Co. Publishers
1981	Sheehan D J	The Pacific Telephone and Telegraph Company
1976	Sheehan D J	R. L. Polk Co. Publishers

2597 LINWOOD AVE

Year	Uses	Source
1990	Vacant	R. L. Polk Co. Publishers
1987	Ross Jeff	R. L. Polk Co. Publishers

2719 LINWOOD AVE

Year	Uses	Source
1990	Dardi Wm	R. L. Polk Co. Publishers
1987	Dardi Bud	R. L. Polk Co. Publishers
1976	Ancell Herbert W	R. L. Polk Co. Publishers
1970	Ancell Herbert W	R. L. Polk Co. Publishers
1965	Ancell H Wayne	R. L. Polk Co. Publishers
1961	Haack Rudolph F	R. L. Polk Co., Publishers
1958	Haack Rudolph F	R. L. Polk Co., Publishers

2759 LINWOOD AVE

Year	Uses	Source
1965	Vacant	R. L. Polk Co. Publishers

2795 LINWOOD AVE

Year	Uses	Source
1990	Vacant	R. L. Polk Co. Publishers
1987	Pieroni Rosie	R. L. Polk Co. Publishers
1965	Vacant	R. L. Polk Co. Publishers
1961	Brown Ray A	R. L. Polk Co., Publishers
1958	Altherr Geo E	R. L. Polk Co., Publishers

2807 LINWOOD AVE

Year	Uses	Source
1994	Morris Pat J	Pacific Bell
	Sedgwick Walter	Pacific Bell
1990	Sedgwick Walter	R. L. Polk Co. Publishers
1987	No Return	R. L. Polk Co. Publishers

FINDINGS

Year	Uses	Source
1981	i Miles Frank T	The Pacific Telephone and Telegraph Company
	MILES LESLIE PLASTERING CO	The Pacific Telephone and Telegraph Company
1976	Miles Leslie F plstr contr	R. L. Polk Co. Publishers
1970	Miles Leslie F plstr contr	R. L. Polk Co. Publishers
1965	Miles Leslie F plastering contr	R. L. Polk Co. Publishers
1961	Cumminns John V	R. L. Polk Co., Publishers
1958	Cummnins John V	R. L. Polk Co., Publishers

2831 LINWOOD AVE

Year	Uses	Source
1990	Vacant	R. L. Polk Co. Publishers
1987	Vacant	R. L. Polk Co. Publishers

2853 LINWOOD AVE

Year	Uses	Source
1990	Voight Geo	R. L. Polk Co. Publishers
1987	Voight Geo	R. L. Polk Co. Publishers
1981	Crawford Lyle	The Pacific Telephone and Telegraph Company
1976	Schultz Edw	R. L. Polk Co. Publishers
1970	Williams Edw S	R. L. Polk Co. Publishers
1965	Vacant	R. L. Polk Co. Publishers
1961	Ferguson Velma PF Mrs	R. L. Polk Co., Publishers
1958	Ferguson Velmia Mrs	R. L. Polk Co., Publishers

2859 LINWOOD AVE

Year	Uses	Source
2006	Marco Construction	AT & T Yellow Pages
1990	Carrino Mark F	R. L. Polk Co. Publishers
1987	Tomasello Lawr	R. L. Polk Co. Publishers
1976	Taylor Marion M	R. L. Polk Co. Publishers
1970	Taylor Marion	R. L. Polk Co. Publishers

2863 LINWOOD AVE

Year	Uses	Source
1990	Adam Laura	R. L. Polk Co. Publishers
1987	Vacant	R. L. Polk Co. Publishers

FINDINGS

2868 LINWOOD AVE

Year	***Uses***	***Source***
2006	GILLOAND Wendy	AT & T Yellow Pages
1990	No Return	R. L. Polk Co. Publishers
1987	No Return	R. L. Polk Co. Publishers
1976	Muegge Wm Jr	R. L. Polk Co. Publishers

FINDINGS

TARGET PROPERTY: ADDRESS NOT IDENTIFIED IN RESEARCH SOURCE

The following Target Property addresses were researched for this report, and the addresses were not identified in the research source.

Address Researched	Address Not Identified in Research Source
2574-2842 and 2862 Linwood Avenue	2013, 2008, 2006, 1958, 1953, 1947, 1935, 1930

ADJOINING PROPERTY: ADDRESSES NOT IDENTIFIED IN RESEARCH SOURCE

The following Adjoining Property addresses were researched for this report, and the addresses were not identified in research source.

Address Researched	Address Not Identified in Research Source
2525 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2533 LINWOOD AVE	2013, 2008, 2006, 1953, 1947, 1935, 1930
2549 LINWOOD AVE	2013, 2008, 2006, 1994, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2550 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1965, 1953, 1947, 1935, 1930
2551 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1965, 1961, 1953, 1947, 1935, 1930
2552 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1961, 1958, 1953, 1947, 1935, 1930
2555 LINWOOD AVE	2013, 2008, 2006, 1994, 1958, 1953, 1947, 1935, 1930
2564 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1961, 1958, 1953, 1947, 1935, 1930
2567 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1965, 1961, 1953, 1947, 1935, 1930
2569 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1965, 1961, 1953, 1947, 1935, 1930
2572 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1961, 1958, 1953, 1947, 1935, 1930
2595 LINWOOD AVE	2013, 2008, 2006, 1994, 1970, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2597 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1976, 1970, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2719 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1953, 1947, 1935, 1930
2759 LINWOOD AVE	2013, 2008, 2006, 1994, 1990, 1987, 1981, 1976, 1970, 1961, 1958, 1953, 1947, 1935, 1930
2795 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1976, 1970, 1953, 1947, 1935, 1930
2807 LINWOOD AVE	2013, 2008, 2006, 1953, 1947, 1935, 1930
2831 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1976, 1970, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2853 LINWOOD AVE	2013, 2008, 2006, 1994, 1953, 1947, 1935, 1930

FINDINGS

Address Researched	Address Not Identified in Research Source
2859 LINWOOD AVE	2013, 2008, 1994, 1981, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2863 LINWOOD AVE	2013, 2008, 2006, 1994, 1981, 1976, 1970, 1965, 1961, 1958, 1953, 1947, 1935, 1930
2868 LINWOOD AVE	2013, 2008, 1994, 1981, 1970, 1965, 1961, 1958, 1953, 1947, 1935, 1930

Exhibit G – Regulatory Records Documentation

No documents available.

ATTACHMENT H

COMMUNITY RISK ASSESSMENT (Air Quality)

Penstemon Place

Illingworth & Rodkin, Inc.
March 8, 2017

PENSTEMON PLACE RESIDENTIAL DEVELOPMENT COMMUNITY RISK ASSESSMENT

Santa Rosa, California

March 8th, 2017

Prepared for:

Nadin Sponamore
Sponamore Associates
2128 Contra Costa Avenue
Santa Rosa, CA 95404

Prepared by:

Tanushree Ganguly and
James Reyff
ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Project: 17-028

Introduction

The purpose of this report is to address the community risk impacts associated with the proposed Penstemon Place residential development project. The approximately 9.7-acre, site is located at 2842, 2862, and 2574 Linwood Avenue in the Southeast quadrant of Santa Rosa. The site is currently occupied by 6 single-family homes. The project proposes to demolish the existing buildings and develop 59 new single-family homes on lots ranging in size from 3,200 square feet to 19,300 square feet (sf). Twelve of these new homes have been designed as 4-unit auto courts. Right–of–way for the planned Farmers Lane Extension lies immediately adjacent to the site to the east.

Air pollutant and toxic air contaminants (TACs) emissions associated with construction of the project were modeled. In addition, the potential construction health risk impacts to nearby sensitive receptors were evaluated. This analysis addresses those issues following the guidance provided by the Bay Area Air Quality Management District (BAAQMD).

Setting

The project is located in the Sonoma County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the State and federal level. The Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

Air Pollutants of Concern

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NOx). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant of the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic Air Contaminants

Toxic air contaminants or TACs are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, and fuel combustion. TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter [DPM] near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State, and federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the State's Proposition 65 or under the Federal Hazardous Air Pollutants programs.

Applicable Regulatory Setting

Federal Regulations

The United States Environmental Protection Agency (USEPA) sets nationwide emission standards for mobile sources, which include on-road (highway) motor vehicles such trucks, buses, and automobiles, and non-road (off-road) vehicles and equipment used in construction, agricultural, industrial, and mining activities (such as bulldozers and loaders). The USEPA also sets nationwide fuel standards. California also has the ability to set motor vehicle emission standards and standards for fuel used in California, as long as they are the same or more stringent than the Federal standards.

In the past decade the USEPA has established a number of emission standards for on- and non-road heavy-duty diesel engines used in trucks and other equipment. This was done in part because diesel engines are a significant source of nitrogen oxides, or NOx, and particulate matter (PM10 and PM2.5) and because the USEPA has identified diesel particulate matter as a probable carcinogen. Implementation of the heavy-duty diesel on-road vehicle standards and the non-road diesel engine standards are estimated to reduce PM and NOx emissions from diesel engines up to 95 percent in 2030 when the heavy-duty vehicle fleet is completely replaced with newer heavy-duty vehicles that comply with these emission standards.[1]

In concert with the diesel engine emission standards, the USEPA has also substantially reduced the amount of sulfur allowed in diesel fuels. The sulfur contained in diesel fuel is a significant contributor to the formation of particulate matter in diesel-fueled engine exhaust. The new standards reduced the amount of sulfur allowed by 97 percent for highway diesel fuel (from 500 parts per million by weight [ppmw] to 15 ppmw), and by 99 percent for off-highway diesel fuel

[1] USEPA, 2000. Regulatory Announcement, Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. EPA420-F-00-057. December 2000.

(from about 3,000 ppmw to 15 ppmw). The low sulfur highway fuel (15 ppmw sulfur), also called ultra-low sulfur diesel (ULSD) is currently required for use by all vehicles in the U.S.

All of the above Federal diesel engine and diesel fuel requirements have been adopted by California, in some cases with modifications making the requirements more stringent or the implementation dates sooner.

State Regulations

To address the issue of diesel emissions in the state, CARB developed the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles[2]. In addition to requiring more stringent emission standards for new on-road and off-road mobile sources and stationary diesel-fueled engines to reduce particulate matter emissions by 90 percent, a significant component of the plan involves application of emission control strategies to existing diesel vehicles and equipment. Many of the measures of the Diesel Risk Reduction Plan have been approved and adopted, including the Federal on-road and non-road diesel engine emission standards for new engines, as well as adoption of regulations for low sulfur fuel in California.

CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of DPM. Several of these regulatory programs affect medium and heavy duty diesel trucks that represent the bulk of DPM emissions from California highways. CARB regulations require on-road diesel trucks to be retrofitted with particulate matter controls or replaced to meet 2010 or later engine standards that have much lower DPM and $PM_{2.5}$ emissions. This regulation will substantially reduce these emissions between 2013 and 2023. While new trucks and buses will meet strict federal standards, this measure is intended to accelerate the rate at which the fleet either turns over so there are more cleaner vehicles on the road, or is retrofitted to meet similar standards. With this regulation, older, more polluting trucks would be removed from the roads sooner.

CARB has also adopted and implemented regulations to reduce DPM and NOx emissions from in-use (existing) and new off-road heavy-duty diesel vehicles (e.g., loaders, tractors, bulldozers, backhoes, off-highway trucks, etc.). The regulations apply to diesel-powered off-road vehicles with engines 25 horsepower (hp) or greater. The regulations are intended to reduce particulate matter and NOx exhaust emissions by requiring owners to turn over their fleet (replace older equipment with newer equipment) or retrofit existing equipment in order to achieve specified fleet-averaged emission rates. Implementation of this regulation, in conjunction with stringent Federal off-road equipment engine emission limits for new vehicles, will significantly reduce emissions of DPM and NOx.

[2] California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. October 2000.

Bay Area Air Quality Management District (BAQMD)

BAAQMD has jurisdiction over an approximately 5,600-square mile area, commonly referred to as the San Francisco Bay Area (Bay Area). The District's boundary encompasses the nine San Francisco Bay Area counties, including Alameda County, Contra Costa County, Marin County, San Francisco County, San Mateo County, Santa Clara County, Napa County, southwestern Solano County and southern Sonoma County. The project is included in the southern portion of Sonoma County that falls under BAAQMD's jurisdiction.

BAAQMD is the lead agency in developing plans to address attainment and maintenance of the National Ambient Air Quality Standards and California Ambient Air Quality Stnadards. The District also has permit authority over most types of stationary equipment utilized for the proposed project. The BAAQMD is responsible for permitting and inspection of stationary sources; enforcement of regulations, including setting fees, levying fines, and enforcement actions; and ensuring that public nuisances are minimized.

The BAAQMD *CEQA Air Quality Guidelines*[3] were prepared to assist in the evaluation of air quality impacts of projects and plans proposed within the Bay Area. The guidelines provide recommended procedures for evaluating potential air impacts during the environmental review process consistent with CEQA requirements including thresholds of significance, mitigation measures, and background air quality information. They also include assessment methodologies for air toxics, odors, and greenhouse gas emissions. In June 2010, the BAAQMD's Board of Directors adopted CEQA thresholds of significance and an update of their *CEQA Guidelines*. In May 2011, the updated BAAQMD *CEQA Air Quality Guidelines* were amended to include a risk and hazards threshold for new receptors and modify procedures for assessing impacts related to risk and hazard impacts.

The BAAQMD's adoption of significance thresholds contained in the 2011 CEQA Air Quality Guidelines was called into question by an order issued March 5, 2012, in California Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires the BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds (Cal. Court of Appeal, First Appellate District, Case Nos. A135335 & A136212). CBIA sought review by the California Supreme Court on three issues, including the appellate court's decision to uphold the BAAQMD's adoption of the thresholds, and the Court granted review on just one: Under what circumstances, if any, does CEQA require an analysis of how existing environmental conditions will impact future residents or users of a proposed project? In December 2015, the Supreme Court determined that an analysis of the impacts of the environment on a project – known as "CEQA-in-reverse" – is only required under two limited circumstances: (1) when a statute provides an express legislative directive to consider such impacts; and (2) when a proposed project risks exacerbating environmental hazards or conditions that already exist (Cal. Supreme Court Case No. S213478). The Supreme Court reversed the Court of Appeal's decision and remanded the matter back to the appellate

[3] Bay Area Air Quality Management District, 2011. *CEQA Air Quality Guidelines*. May.

court to reconsider the case in light of the Supreme Court's ruling. Accordingly, the case is currently pending back in the Court of Appeal. Because the Supreme Court's holding concerns the effects of the environment on a project (as contrasted to the effects of a proposed project on the environment), and not the science behind the thresholds, the significance thresholds contained in the 2011 CEQA Air Quality Guidelines are applied to this project.

City of Santa Rosa

Santa Rosa General Plan 2035's Open Space and Conservation Element contains polices meant to improve and maintain air quality and impacts to the community from air pollution. Specific policies applicable to the project include:

OSC-J-1: Review all new construction projects and require dust abatement actions as contained in the CEQA Handbook of the Bay Area Air Quality Management District.

OSC-J-3: Reduce particulate matter emissions from wood burning appliances through implementation of the city's Wood Burning Appliance code.

Sensitive Receptors

There are groups of people more affected by air pollution than others. CARB has identified the following persons who are most likely to be affected by air pollution: children under 16, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, and parks. For cancer risk assessments, children are the most sensitive receptors, since they are more susceptible to cancer causing TACs. Residential locations are assumed to include infants and small children. The closest sensitive receptors include the single-family homes to the north, west and south of the project site.

Significance Thresholds

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These Thresholds were designed to establish the level at which BAAQMD believed air pollution emissions would cause significant environmental impacts under CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The significance thresholds identified by BAAQMD and used in this analysis are summarized in *Table 1*.

Table 1. Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
Criteria Air Pollutants			
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (Exhaust)	82	15
$PM_{2.5}$	54 (Exhaust)	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for Single Sources			
Excess Cancer Risk	>10 per one million		
Hazard Index	>1.0		
Incremental annual $PM_{2.5}$	>0.3 $\mu g/m^3$		
Health Risks and Hazards for Combined Sources (Cumulative from all sources within 1,000 foot zone of influence)			
Excess Cancer Risk	>100 per one million		
Hazard Index	>10.0		
Annual Average $PM_{2.5}$	>0.8 $\mu g/m^3$		
Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less			

Impact 1: Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable State or federal ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? ***Less than significant with construction-period mitigation measures.***

The Bay Area is considered a non-attainment area for ground-level ozone and $PM_{2.5}$ under both the Federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the federal act. The area has attained both State and federal ambient air quality standards for carbon monoxide. As part of an effort to attain and maintain ambient air quality standards for ozone and PM_{10}, the BAAQMD has established thresholds of significance for these air pollutants and their precursors. These thresholds are for ozone precursor pollutants (ROG and NOx), PM_{10}, and $PM_{2.5}$ and apply to both construction period and operational period impacts.

The California Emissions Estimator Model (CalEEMod) Version 2016.3.1 was used to predict emissions from construction and operation of the site assuming full build out of the project. The project land use types and size, and anticipated construction schedule were input to CalEEMod.

Construction period emissions

CalEEMod provided annual emissions for construction. CalEEMod provides emission estimates for both on-site and off-site construction activities. On-site activities are primarily made up of construction equipment emissions, while off-site activity includes worker, hauling, and vendor traffic. A construction build-out scenario, including equipment list and schedule, was based on information provided by the project applicant. The proposed project land uses were input into CalEEMod, which included: 59 dwelling units entered as "Single-Family Housing" on a 9.7-acre site.

Approximately 15,860 cubic yards (cy) of soil export is anticipated during grading and was entered into the model. Demolition of 20,000 square feet (sf) of building is anticipated and was entered into the model. Additionally, 94 cement truck round-trips during building construction and 78 paving roundtrips are expected and were entered into the model. Modeling assumed 16 cy/truck and 20 tons/truck.

The construction schedule assumes that the project would be built out over a period of approximately 20 months beginning in April 2019, or an estimated 440 construction workdays (assuming an average of 22 construction days per month). Average daily emissions were computed by dividing the total construction emissions by the number of construction days. *Table 2* shows average daily construction emissions of ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust during construction of the project. As indicated in *Table 2*, predicted the construction period emissions would not exceed the BAAQMD significance thresholds.

Construction activities, particularly during site preparation and grading, would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are implemented to reduce these emissions. *Mitigation Measure 1 would implement BAAQMD-recommended best management practices*.

Table 2. Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust
Total construction emissions (tons)	1.21 tons	3.84 tons	0.19 tons	0.17 tons
Average daily emissions (pounds)[1]	5.5 lbs.	17.5 lbs.	0.9 lbs.	0.8 lbs.
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**
Notes: [1]Assumes 440 workdays.				

Operational emissions were also predicted using CalEEMod and reported in *Table 3*. These emissions were found to be well below the significance thresholds.

Table 3. Operational Period Emissions

Scenario	ROG	NOx	PM_{10}	$PM_{2.5}$
Total annual emissions (tons)	1.10 tons	1.04 tons	0.57 tons	0.22 tons
BAAQMD Thresholds (tons)	*10*	*10*	*15*	*10*
Average daily emissions (pounds)[1]	6.0 lbs.	5.7 lbs.	3.1 lbs.	1.2 lbs.
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**
Notes: [1]Assumes 365 days.				

Mitigation Measure 1: **Include basic measures to control dust and exhaust during construction.**

During any construction period ground disturbance, the applicant shall ensure that the project contractor implement measures to control dust and exhaust. Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality impacts associated with grading and new construction to a less than significant level. The contractor shall implement the following best management practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

4. All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Impact 2: Violate any air quality standard or contribute substantially to an existing or projected air quality violation? ***Less than significant.***

As discussed under Impact 1, the project would have emissions less than the BAAQMD thresholds for evaluating impacts related to ozone and particulate matter. Therefore, the project would not contribute substantially to existing or projected violations of those standards. Carbon monoxide emissions from traffic generated by the project would be the pollutant of greatest concern at the local level. Congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of carbon monoxide. Air pollutant monitoring data indicate that carbon monoxide levels have been at healthy levels (i.e., below State and federal standards) in the Bay Area since the early 1990s. As a result, the region has been designated as attainment for the standard. The highest measured level over any 8-hour averaging period during the last 3 years in the Bay Area is less than 3.0 parts per million (ppm), compared to the ambient air quality standard of 9.0 ppm. Intersections affected by the project would have traffic volumes less than the BAAQMD screening criteria of 44,000 total vehicle movements in an intersection during the busiest hour and, thus, would not cause a violation of an ambient air quality standard or have a considerable contribution to cumulative violations of these standards.

Impact 3: Expose sensitive receptors to substantial pollutant concentrations? ***Less than significant with construction period mitigation.***

Project impacts related to increased community risk can occur either by introducing a new sensitive receptor, such as a residential use, in proximity to an existing source of TACs or by introducing a new source of TACs with the potential to adversely affect existing sensitive receptors in the project vicinity. The BAAQMD recommends using a 1,000-foot screening radius around a project site for purposes of identifying community health risk from siting a new sensitive receptor or a new source of TACs. Operation of the project is not expected to cause any localized emissions that could expose sensitive receptors to unhealthy air pollutant levels. No stationary sources of TACs, such as generators, are proposed as part of the project. The project would introduce new sensitive receptors to the area (although not an air quality impact under CEQA). Construction activity would generate dust and equipment exhaust on a temporary basis that could affect nearby sensitive receptors.

Operational Community Risk Impacts

For informational purposes, the impact of TAC and $PM_{2.5}$ sources to the project site was evaluated. Community health risk assessments typically look at all substantial sources of TACs that can affect sensitive receptors that are located within 1,000 feet of a project site. These sources include freeways or highways, busy surface streets and stationary sources identified by BAAQMD. Traffic on high volume roadways is a source of TAC emissions that may adversely affect sensitive receptors in close proximity to the roadway. For local roadways, BAAQMD considers roadways with traffic volumes of over 10,000 vehicles per day to have a potentially significant impact on a proposed project. The traffic volume on the future Farmers Lane Extension that would run along the eastern boundary of the project is expected to exceed 10,000 vehicles per day. A review of BAAQMD's Google Earth map tool did not identify any stationary sources with the potential to affect the project site

For local roadways, BAAQMD has provided the *Roadway Screening Analysis Calculator* to assess whether roadways with traffic volumes of over 10,000 vehicles per day may have a potentially significant effect on a proposed project. Two adjustments were made to the cancer risk predictions made by this calculator: (1) adjustment for latest vehicle emissions rates and (2) adjustment of cancer risk to reflect new OEHHA guidance (see *Attachment 1*).

The calculator uses EMFAC2011 emission rates for the year 2014. Overall, emission rates will decrease by the time the project is constructed and occupied. The project is not likely to be occupied prior to 2021. In addition, a new version of the emissions factor model, EMFAC2014 is available. This version predicts lower emission rates. An adjustment factor of 0.5 was developed by comparing emission rates of total organic gases (TOG) for running exhaust and running losses developed using EMFAC2011 for year 2014 and those from EMFAC2014 for year 2018.

The predicted cancer risk was then adjusted using a factor of 1.3744 to account for new OEHHA guidance. This factor was provided by BAAQMD for use with their CEQA screening tools that are used to predict cancer risk.[4]

The Average Daily Traffic (ADT) on Farmer Lane was estimated to be 14,100 vehicles per day[5]. Using the BAAQMD *Roadway Screening Analysis Calculator* for Sonoma County for north-south directional roadways and at a distance of approximately 75 feet west of the roadway, estimated cancer risk from Farmer Lane Extension at the nearest on-site receptor would be 2.9 per million and $PM_{2.5}$ concentration would be 0.11 $\mu g/m^3$. Chronic or acute HI for the roadway would be below 0.03.

Project Construction Activity

Construction activities, particularly during site preparation and grading would temporarily generate fugitive dust in the form of respirable particulate matter (PM_{10}) and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered

[4] Correspondence with Alison Kirk, BAAQMD, November 23, 2015.

[5] Email from Briana Byrne of W-Trans to Nadin Sponamore on February 28, 2017 reporting average daily traffic projections for the Farmers Lane Extension based on the Sonoma County Transportation Authority traffic model.

loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are employed to reduce these emissions. *Mitigation Measure 1 would implement BAAQMD-required best management practices*.

Construction equipment and associated heavy-duty truck traffic generates diesel exhaust, which is a known TAC. These exhaust air pollutant emissions would not be considered to contribute substantially to existing or projected air quality violations. Construction exhaust emissions may still pose community risks for sensitive receptors such as nearby residents. The primary community risk impact issues associated with construction emissions are cancer risk and exposure to $PM_{2.5}$. Diesel exhaust poses both a potential health and nuisance impact to nearby receptors. A community risk assessment of the project construction activities was conducted that evaluated potential health effects of sensitive receptors at these nearby residences from construction emissions of DPM and $PM_{2.5}$.[6] The closest sensitive receptors to the project site are the single-family homes lining the northern, western, and southern boundary of the project site (Figure1). Emissions and dispersion modeling was conducted to predict the off-site DPM concentrations resulting from project construction, so that lifetime cancer risks and non-cancer health effects could be evaluated.

On-Site Construction TAC Emissions

Construction period emissions were computed using CalEEMod along with projected construction activity, as described above. The CalEEMod model provided total annual $PM_{2.5}$ exhaust emissions (assumed to be DPM) for the off-road construction equipment used for construction of the project and for the exhaust emissions from on-road vehicles (haul trucks, vendor trucks, and worker vehicles) of 0.185 tons (370 pounds) over the construction period. A trip length of one-half mile was used to represent vehicle travel while at or near the construction site. For modeling purposes, it was assumed that these emissions from on-road vehicles would occur at the construction site. Fugitive dust $PM_{2.5}$ emissions were also computed and included in this analysis. The model predicts emissions of 0.089 tons (178 pounds) of fugitive $PM_{2.5}$ over the construction period.

Dispersion Modeling

The U.S. EPA ISCST3 dispersion model was used to predict concentrations of DPM and $PM_{2.5}$ concentrations at sensitive receptors (residences) in the vicinity of the project construction area. The ISCST3 dispersion model is a BAAQMD-recommended model for use in modeling analysis of these types of emission activities for CEQA projects.[7] For each phase of construction the ISCST3 modeling utilized two area sources to represent the on-site construction emissions, one for exhaust emissions and one for fugitive dust emissions. To represent the construction equipment exhaust emissions, an emission release height of 6 meters (19.7 feet) was used for the area source. The elevated source height reflects the height of the equipment exhaust pipes plus

[6] DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.
[7] Bay Area Air Quality Management District (BAAQMD), 2012, *Recommended Methods for Screening and Modeling Local Risks and Hazards, Version 3.0.* May.

an additional distance for the height of the exhaust plume above the exhaust pipes to account for plume rise of the exhaust gases. For modeling fugitive $PM_{2.5}$ emissions, a near-ground level release height of 2 meters (6.6 feet) was used for the area source. Emissions from the construction equipment and on-road vehicle travel were distributed throughout the modeled area sources. Construction emissions were modeled as occurring daily between 7 a.m. to 4 p.m., when the majority of construction activity would occur.

The modeling used a 5-year meteorological data set (2001-2005) from the Santa Rosa Airport prepared for use with the ISCST3 model by the BAAQMD. Annual DPM and $PM_{2.5}$ concentrations from construction activities during the 2019-2020 period were calculated using the model. DPM and $PM_{2.5}$ concentrations were calculated at nearby sensitive receptor locations. Receptor height of 1.5 meters (4.9 feet) was used to represent the breathing height of residents in nearby single-family homes.

Receptors where the maximum modeled DPM and $PM_{2.5}$ concentration occurred have been identified in *Figure 1*. Using the maximum annual modeled DPM concentrations, the maximum increased cancer risks were calculated. *Attachment 3* to this report includes the emission calculations used for the construction area source modeling and the cancer risk calculations.

Cancer Risks

Results of this assessment indicate that the maximum excess residential cancer risks would be 59.1 in one million for infant exposures and 1.2 in one million for an adult exposure. The maximum residential excess cancer risk for infant exposure would be greater than the BAAQMD significance threshold of 10 in one million. *Implementation of Mitigation Measures 1 and 2 would reduce this impact to a level of less than significant.*

Predicted Annual $PM_{2.5}$ Concentration

The maximum-modeled annual $PM_{2.5}$ concentration, which is based on combined exhaust and fugitive dust emissions, was 0.61 $\mu g/m^3$, and the receptor with the highest concentration is identified in *Figure 1*. The maximum annual $PM_{2.5}$ concentration at the MEI residential receptor location would exceed the BAAQMD significance threshold of 0.3 $\mu g/m^3$.

Non-Cancer Hazards

The maximum modeled annual residential DPM concentration (i.e., from construction exhaust) was 0.2276 $\mu g/m^3$. The maximum computed HI based on this DPM concentration is 0.05, which is much lower than the BAAQMD significance criterion of a HI greater than 1.0.

Cumulative Construction Risk Assessment

There are also cumulative community risk thresholds used to evaluate construction impacts. The cumulative impacts of TAC emissions from construction of the project, and expected traffic on Farmer Lane Extension on the construction maximally exposed individual (MEI) are summarized in *Table 4*. The impacts from the future Farmers Lane Extension are based on the

BAAQMD Roadway Screening Calculator (described above). The location where the maximum construction cancer risk would occur is 200 feet west of the future roadway edge. The location where maximum construction $PM_{2.5}$ concentration would occur is at a receptor 330 feet west of the future roadway. As shown in *Table 4*, the sum of impacts from combined sources at the construction MEI would be below the thresholds of significance and this impact would be considered *less-than-significant*.

Table 4. Cumulative Construction Risk Assessment

Source	Maximum Cancer Risk (per million)	Maximum Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Maximum Hazard Index
Project Construction Unmitigated Mitigated	 59.1 6.5	 0.61 <0.10	 0.05 <0.01
Future Farmer Lane Extension (200 ft west for cancer risk and 330 ft west for $PM_{2.5}$)	1.6	0.03	<0.01
Cumulative Total **Unmitigated** **Mitigated**	 60.7 8.1	 0.64 <0.13	 <0.06 <0.02
BAAQMD Threshold – Cumulative Sources	***>100***	***>0.8***	***>10.0***
Significant?	***No***	***No***	***No***

Mitigation Measure 2 **Selection of equipment during construction to minimize emissions.**

The project shall develop a plan demonstrating that the off-road equipment used on-site to construct the project would achieve a fleet-wide average 69 percent reduction in $PM_{2.5}$ exhaust emissions or greater. One feasible plan to achieve this reduction would require that all mobile diesel-powered off-road equipment larger than 25 horsepower and operating on the site for more than two days continuously shall meet, at a minimum, U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent. The construction contractor could use other measures to minimize construction period DPM emission to reduce the predicted cancer risk below the thresholds. The use of equipment that includes CARB-certified Level 3 Diesel Particulate Filters[1] or alternatively-fueled equipment (i.e., non-diesel) would meet this requirement. Other measures may be the use of added exhaust devices, or a combination of measures, provided that these measures are approved by the City and demonstrated to reduce community risk impacts to less than significant.

Effectiveness of Mitigation Measures 1 and 2

Implementation of *Mitigation Measure 1* is considered to reduce exhaust emissions by 5 percent. Implementation of *Mitigation Measures 2* would further reduce on-site diesel exhaust emissions. This effect was evaluated using the CalEEMod model to assume best management practices for

[1] See http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

controlling fugitive dust (i.e., application of Mitigation Measure 1) and use of Tier 2 equipment with Level 3 Diesel Particulate Matter Filters (DPFs). The CalEEMod modeling indicated that mitigated exhaust PM_{10} emissions would be 89 percent lower and the $PM_{2.5}$ emissions would be 84 percent lower. This was assumed to result in a proportional decrease in cancer risk and annual $PM_{2.5}$ concentrations, such that the mitigated risk would be 6.5 in one million and the $PM_{2.5}$ concentration would be less than 0.1 $\mu g/m^3$. After implementation of these mitigation measures, the project would have a *less-than-significant* impact with respect to community risk caused by construction activities.

Figure 1. Project Construction Site and Locations of Off-Site Sensitive Receptors and Maximum TAC and $PM_{2.5}$ Impacts

Attachment 1: Health Risk Calculation Methodology

A health risk assessment (HRA) for exposure to Toxic Air Contaminates (TACs) requires the application of a risk characterization model to the results from the air dispersion model to estimate potential health risk at each sensitive receptor location. The State of California Office of Environmental Health Hazard Assessment (OEHHA) and California Air Resources Board (CARB) develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[8] These guidelines incorporate substantial changes designed to provide for enhanced protection of children, as required by State law, compared to previous published risk assessment guidelines. CARB has provided additional guidance on implementing OEHHA's recommended methods.[9] This HRA used the recent 2015 OEHHA risk assessment guidelines and CARB guidance. The BAAQMD has adopted recommended procedures for applying the newest OEHHA guidelines as part of Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.[10] Exposure parameters from the OEHHA guidelines and the recent BAAQMD HRA Guidelines were used in this evaluation.

<u>Cancer Risk</u>

Potential increased cancer risk from inhalation of TACs are calculated based on the TAC concentration over the period of exposure, inhalation dose, the TAC cancer potency factor, and an age sensitivity factor to reflect the greater sensitivity of infants and children to cancer causing TACs. The inhalation dose depends on a person's breathing rate, exposure time and frequency of exposure, and the exposure duration. These parameters vary depending on the age, or age range, of the persons being exposed and whether the exposure is considered to occur at a residential location or other sensitive receptor location.

The current OEHHA guidance recommends that cancer risk be calculated by age groups to account for different breathing rates and sensitivity to TACs. Specifically, they recommend evaluating risks for the third trimester of pregnancy to age zero, ages zero to less than two (infant exposure), ages two to less than 16 (child exposure), and ages 16 to 70 (adult exposure). Age sensitivity factors (ASFs) associated with the different types of exposure are an ASF of 10 for the third trimester and infant exposures, an ASF of 3 for a child exposure, and an ASF of 1 for an adult exposure. Also associated with each exposure type are different breathing rates, expressed as liters per kilogram of body weight per day (L/kg-day). As recommended by the BAAQMD, 95th percentile breathing rates are used for the third trimester and infant exposures, and 80th percentile breathing rates for child and adult exposures. Additionally, CARB and the BAAQMD recommend the use of a residential exposure duration of 30 years for sources with long-term emissions (e.g., roadways).

Under previous OEHHA and BAAQMD HRA guidance, residential receptors are assumed to be at their home 24 hours a day, or 100 percent of the time. In the 2015 Risk Assessment Guidance, OEHHA includes adjustments to exposure duration to account for the fraction of time at home (FAH), which can be less than 100 percent of the time, based on updated population and activity statistics. The FAH factors are age-specific and are: 0.85 for third trimester of pregnancy to less than 2 years old, 0.72 for ages 2 to less than 16 years, and 0.73 for ages 16 to 70 years. Use of the FAH factors is allowed by the BAAQMD if there are no schools in the project vicinity that would have a cancer risk of one in a million or greater assuming 100 percent exposure (FAH = 1.0).

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[8] OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. February.

[9] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.

[10] BAAQMD, 2016. *BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines*. January 2016.

Functionally, cancer risk is calculated using the following parameters and formulas:

Cancer Risk (per million) = *CPF x Inhalation Dose x ASF x ED/AT x FAH x* 10^6

Where:

CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = $C_{air} \times DBR \times A \times (EF/365) \times 10^{-6}$

Where:

C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

The health risk parameters used in this evaluation are summarized as follows:

	Exposure Type →	**Infant**		**Child**		**Adult**
Parameter	***Age Range →***	**3rd Trimester**	**0<2**	**2 < 9**	**2 < 16**	**16 - 30**
DPM Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	631	572	261
Inhalation Absorption Factor		1	1	1	1	1
Averaging Time (years)		70	70	70	70	70
Exposure Duration (years)		0.25	2	14	14	14
Exposure Frequency (days/year)		350	350	350	350	350
Age Sensitivity Factor		10	10	3	3	1
Fraction of Time at Home		0.85-1.0	0.85-1.0	0.72-1.0	0.72-1.0	0.73

* 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults

Non-Cancer Hazards

Potential non-cancer health hazards from TAC exposure are expressed in terms of a hazard index (HI), which is the ratio of the TAC concentration to a reference exposure level (REL). OEHHA has defined acceptable concentration levels for contaminants that pose non-cancer health hazards. TAC concentrations below the REL are not expected to cause adverse health impacts, even for sensitive individuals. The total HI is calculated as the sum of the HIs for each TAC evaluated and the total HI is compared to the BAAQMD significance thresholds to determine whether a significant non-cancer health impact from a project would occur.

Typically, for residential projects located near roadways with substantial TAC emissions, the primary TAC of concern with non-cancer health effects is diesel particulate matter (DPM). For DPM, the chronic inhalation REL is 5 micrograms per cubic meter ($\mu g/m^3$).

Annual $PM_{2.5}$ Concentrations

While not a TAC, fine particulate matter ($PM_{2.5}$) has been identified by the BAAQMD as a pollutant with potential non-cancer health effects that should be included when evaluating potential community health

impacts under the California Environmental Quality Act (CEQA). The thresholds of significance for $PM_{2.5}$ (project level and cumulative) are in terms of an increase in the annual average concentration. When considering $PM_{2.5}$ impacts, the contribution from all sources of $PM_{2.5}$ emissions should be included. For projects with potential impacts from nearby local roadways, the $PM_{2.5}$ impacts should include those from vehicle exhaust emissions, $PM_{2.5}$ generated from vehicle tire and brake wear, and fugitive emissions from re-suspended dust on the roads.

Attachment 2: Construction Schedule, CalEEMod Output Files, Health Risk Calculations, Roadway Risk Calculations

Project Name: Penstemon Place

Project Size 59 s.f. residential 9.7 total project acres disturbed

6 s.f. other, specify: Second Units

s.f. parking lot spaces

Construction Hours 8 am to 6 pm

Complete ALL Portions in Yellow

Qty	Description	HP	Load Factor	Hours/day	Total Work Days	Avg. Hours per day	Comments
	Demolition	**Start Date:**	**4/1/2019**	**Total phase:**	**22**		**Overall Import/Export Volumes**
		End Date:	**5/1/2019**				
	Concrete/Industrial Saws	81	0.73	8	5	1.8181818	**Demolition Volume**
	Excavators	162	0.38	8	5	1.8181818	Square footage of buildings to be demolished
	Rubber-Tired Dozers	255	0.4	8	5	1.8181818	(*or* total tons to be hauled)
	Tractors/Loaders/Backhoes	97	0.37	8	5	1.8181818	**_40000_** square feet *or*
							_?_ Hauling volume (tons)
	Site Preperation	**Start Date:**	**5/1/2019**	**Total phase:**	**10**		Any pavement demolished and hauled? **_None_**
		End Date:	**5/14/2019**				**Soil Hauling Volume**
	Graders	174	0.41			0	
3	Rubber Tired Dozers	255	0.4	8	10	8	Export volume = _ cubic yards?
4	Tractors/Loaders/Backhoes	97	0.37	8	10	8	Import volume = **_0_** cubic yards
	Grading / Excavation	**Start Date:**	**5/15/2019**	**Total phase:**	**88**		
		End Date:	**9/15/2019**				**Soil Hauling Volume**
	Scrapers	361	0.48	8	20	1.8181818	
1	Excavators	162	0.38	8	20	1.8181818	Export volume = **_15,860_** cubic yards
1	Graders	174	0.41	8	20	1.8181818	Import volume = **_0_** cubic yards
1	Rubber Tired Dozers	255	0.4	8	20	1.8181818	
3	Tractors/Loaders/Backhoes	97	0.37	8	20	1.8181818	
	Other Equipment?						
	Trenching	**Start Date:**	**7/15/2019**	**Total phase:**	**44**		
		End Date:	**9/15/2019**				
1	Tractor/Loader/Backhoe	97	0.37	6	10	1.3636364	
1	Excavators	162	0.38	6	10	1.3636364	
	Other Equipment?						
	Building - Exterior	**Start Date:**	**10/16/2019**	**Total phase:**	**230**		**Cement Trucks 94 Total Round-Trips**
		End Date:	**10/15/2020**				
1	Cranes	226	0.29	7	230	7	Electric? (Y/N) _Y__ Otherwise assumed diesel
3	Forklifts	89	0.2	8	230	8	Liquid Propane (LPG)? (Y/N) ___ Otherwise Assumed diesel
1	Generator Sets	84	0.74	8	230	8	Or temporary line power? (Y/N) _Y_
3	Tractors/Loaders/Backhoes	97	0.37	7	230	7	otherwise, assume diesel generator
1	Welders	46	0.45	8	230	8	
	Other Equipment?					0	
Building - Interior/Architectural Coating		**Start Date:**	**1/1/2020**	**Total phase:**	**230**		
		End Date:	**12/31/2020**				
1	Air Compressors	78	0.48	6	20	0.5217391	
1	Aerial Lift	62	0.31	6	20	0.5217391	
	Other Equipment?						
	Paving	**Start Date:**	**9/15/2019**	**Total phase:**	**20**		
		Start Date:	**10/15/2019**				
	Cement and Mortar Mixers	9	0.56			0	
2	Pavers	125	0.42	8	20	8	**Asphalt 783 cubic yards or 78 round trips**
2	Paving Equipment	130	0.36	8	20	8	
2	Rollers	80	0.38	8	20	8	
	Tractors/Loaders/Backhoes	97	0.37			0	
	Other Equipment?						

Equipment listed in this sheet is to provide an example of inputs — **Add or subtract phases and equipment, as appropriate**

It is assumed that water trucks would be used during grading — **Modify horepower or load factor, as appropriate**

Typical Equipment Type & Load Factors

OFFROAD Equipment Type	HP	Load Factor
Aerial Lifts	62	0.31
Air Compressors	78	0.48
Bore/Drill Rigs	205	0.5
Cement and Mortar Mixers	9	0.56
Concrete/Industrial Saws	81	0.73
Cranes	226	0.29
Crawler Tractors	208	0.43
Crushing/Proc. Equipment	85	0.78
Dumpers/Tenders	16	0.38
Excavators	162	0.38
Forklifts	89	0.2
Generator Sets	84	0.74
Graders	174	0.41
Off-Highway Tractors	122	0.44
Off-Highway Trucks	400	0.38
Other Construction Equipment	171	0.42
Other General Industrial Equipment	150	0.34
Other Material Handling Equipment	167	0.4
Pavers	125	0.42
Paving Equipment	130	0.36
Plate Compactors	8	0.43
Pressure Washers	13	0.2
Pumps	84	0.74
Rollers	80	0.38
Rough Terrain Forklifts	100	0.4
Rubber Tired Dozers	255	0.4
Rubber Tired Loaders	199	0.36
Scrapers	361	0.48
Signal Boards	6	0.82
Skid Steer Loaders	64	0.37
Surfacing Equipment	253	0.3
Sweepers/Scrubbers	64	0.46
Tractors/Loaders/Backhoes	97	0.37
Trenchers	80	0.5
Welders	46	0.45

Criteria Air Pollutants Construction and Operation

Penstemen Place, TAC

Sonoma-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	59.00	Dwelling Unit	9.70	118,017.00	169

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	75
Climate Zone	4			**Operational Year**	2021
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	435	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - use PG&E default

Land Use - Based on application and project descrition

Construction Phase - Based on applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Trips and VMT - 78 round tripds during paving

94 cement truck round trips

Demolition - Used Google earth polygon tool to quantify demlition square footage

Grading - 15860 cy of material exported

Woodstoves - No wood burning

Construction Off-road Equipment Mitigation - Best Managemnt Practices

Tier 2 Mitigation

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 2
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tblConstEquipMitigation	Tier	No Change	Tier 2
tblConstEquipMitigation	Tier	No Change	Tier 2
tblConstructionPhase	NumDays	20.00	230.00
tblConstructionPhase	NumDays	20.00	22.00
tblConstructionPhase	NumDays	20.00	88.00
tblGrading	MaterialExported	0.00	15,860.00
tblLandUse	BuildingSpaceSquareFeet	106,200.00	118,017.00
tblLandUse	LandUseSquareFeet	106,200.00	118,017.00
tblLandUse	LotAcreage	19.16	9.70
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	0.50
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblProjectCharacteristics	CO2IntensityFactor	641.35	435
tblProjectCharacteristics	OperationalYear	2018	2021
tblTripsAndVMT	HaulingTripNumber	1,983.00	1,982.00
tblTripsAndVMT	HaulingTripNumber	0.00	156.00
tblTripsAndVMT	HaulingTripNumber	0.00	188.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.1818	2.0448	1.2911	3.0300e-003	0.2326	0.0874	0.3200	0.0975	0.0812	0.1788	0.0000	277.7949	277.7949	0.0557	0.0000	279.1862
2020	1.0325	1.7916	1.5999	2.7800e-003	0.0229	0.0995	0.1224	6.1800e-003	0.0936	0.0998	0.0000	241.8023	241.8023	0.0518	0.0000	243.0960

Maximum	**1.0325**	**2.0448**	**1.5999**	**3.0300e-003**	**0.2326**	**0.0995**	**0.3200**	**0.0975**	**0.0936**	**0.1788**	**0.0000**	**277.7949**	**277.7949**	**0.0557**	**0.0000**	**279.1862**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0875	2.0414	1.3732	3.0300e-003	0.1240	0.0542	0.1783	0.0293	0.0541	0.0835	0.0000	277.7947	277.7947	0.0557	0.0000	279.1860
2020	0.9406	2.1874	1.6909	2.7800e-003	0.0229	0.0810	0.1039	6.1800e-003	0.0810	0.0872	0.0000	241.8020	241.8020	0.0518	0.0000	243.0958
Maximum	**0.9406**	**2.1874**	**1.6909**	**3.0300e-003**	**0.1240**	**0.0810**	**0.1783**	**0.0293**	**0.0810**	**0.0872**	**0.0000**	**277.7947**	**277.7947**	**0.0557**	**0.0000**	**279.1860**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**15.33**	**-10.23**	**-5.99**	**0.00**	**42.50**	**27.63**	**36.22**	**65.76**	**22.71**	**38.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**4-1-2019**	**6-30-2019**	0.7025	0.5830
2	**7-1-2019**	**9-30-2019**	0.7417	0.7129
3	**10-1-2019**	**12-31-2019**	0.7572	0.8071
4	**1-1-2020**	**3-31-2020**	0.9736	1.0853
5	**4-1-2020**	**6-30-2020**	0.9721	1.0839
6	**7-1-2020**	**9-30-2020**	0.7503	0.8288
		Highest	0.9736	1.0853

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.9050	0.0127	0.9447	1.0700e-003		0.0753	0.0753		0.0753	0.0753	7.4996	2.5570	10.0565	0.0149	4.3000e-004	10.5559
Energy	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	213.9891	213.9891	8.8900e-003	3.4700e-003	215.2440
Mobile	0.1867	0.9313	2.0745	6.0700e-003	0.4777	6.3500e-003	0.4840	0.1286	5.9600e-003	0.1345	0.0000	557.8869	557.8869	0.0250	0.0000	558.5123
Waste						0.0000	0.0000		0.0000	0.0000	14.4083	0.0000	14.4083	0.8515	0.0000	35.6960
Water						0.0000	0.0000		0.0000	0.0000	1.2196	5.7778	6.9973	0.1256	3.0400e-003	11.0436
Total	**1.1032**	**1.0418**	**3.0607**	**7.7600e-003**	**0.4777**	**0.0896**	**0.5673**	**0.1286**	**0.0892**	**0.2178**	**23.1274**	**780.2107**	**803.3381**	**1.0259**	**6.9400e-003**	**831.0518**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.9050	0.0127	0.9447	1.0700e-003		0.0753	0.0753		0.0753	0.0753	7.4996	2.5570	10.0565	0.0149	4.3000e-004	10.5559
Energy	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	213.9891	213.9891	8.8900e-003	3.4700e-003	215.2440

Mobile	0.1867	0.9313	2.0745	6.0700e-003	0.4777	6.3500e-003	0.4840	0.1286	5.9600e-003	0.1345	0.0000	557.8869	557.8869	0.0250	0.0000	558.5123
Waste						0.0000	0.0000		0.0000	0.0000	14.4083	0.0000	14.4083	0.8515	0.0000	35.6960
Water						0.0000	0.0000		0.0000	0.0000	1.2196	5.7778	6.9973	0.1256	3.0400e-003	11.0436
Total	**1.1032**	**1.0418**	**3.0607**	**7.7600e-003**	**0.4777**	**0.0896**	**0.5673**	**0.1286**	**0.0892**	**0.2178**	**23.1274**	**780.2107**	**803.3381**	**1.0259**	**6.9400e-003**	**831.0518**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	4/1/2019	4/30/2019	5	22	
2	Site Preparation	Site Preparation	5/1/2019	5/14/2019	5	10	
3	Grading	Grading	5/15/2019	9/13/2019	5	88	
4	Trenching	Trenching	7/15/2019	9/12/2019	5	44	
5	Paving	Paving	9/15/2019	10/11/2019	5	20	
6	Building Construction	Building Construction	10/16/2019	9/1/2020	5	230	
7	Architectural Coating	Architectural Coating	1/1/2020	11/17/2020	5	230	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 69.3

Acres of Paving: 0

Residential Indoor: 238,984; Residential Outdoor: 79,661; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	1.80	81	0.73
Demolition	Excavators	1	1.80	158	0.38
Demolition	Rubber Tired Dozers	1	1.80	247	0.40
Demolition	Tractors/Loaders/Backhoes	1	1.80	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	1.80	158	0.38
Grading	Graders	1	1.80	187	0.41
Grading	Rubber Tired Dozers	1	1.80	247	0.40
Grading	Scrapers	3	1.80	367	0.48
Grading	Tractors/Loaders/Backhoes	1	1.80	97	0.37
Trenching	Excavators	1	1.40	158	0.38
Trenching	Tractors/Loaders/Backhoes	1	1.40	97	0.37
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Architectural Coating	Aerial Lifts	1	0.50	63	0.31

Architectural Coating	Air Compressors	1	0.50	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	91.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	7	18.00	0.00	1,982.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Trenching	2	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	156.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	21.00	6.00	188.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	2	4.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.8400e-003	0.0000	9.8400e-003	1.4900e-003	0.0000	1.4900e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1700e-003	0.0512	0.0335	6.0000e-005		2.7300e-003	2.7300e-003		2.5600e-003	2.5600e-003	0.0000	5.0671	5.0671	1.2800e-003	0.0000	5.0990
Total	**5.1700e-003**	**0.0512**	**0.0335**	**6.0000e-005**	**9.8400e-003**	**2.7300e-003**	**0.0126**	**1.4900e-003**	**2.5600e-003**	**4.0500e-003**	**0.0000**	**5.0671**	**5.0671**	**1.2800e-003**	**0.0000**	**5.0990**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.3000e-004	0.0147	3.0000e-003	4.0000e-005	7.5000e-004	7.0000e-005	8.3000e-004	2.1000e-004	7.0000e-005	2.8000e-004	0.0000	3.5407	3.5407	2.2000e-004	0.0000	3.5464
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.7000e-004	4.3000e-004	4.2800e-003	1.0000e-005	8.6000e-004	1.0000e-005	8.7000e-004	2.3000e-004	1.0000e-005	2.4000e-004	0.0000	0.8206	0.8206	3.0000e-005	0.0000	0.8214
Total	**1.0000e-003**	**0.0151**	**7.2800e-003**	**5.0000e-005**	**1.6100e-003**	**8.0000e-005**	**1.7000e-003**	**4.4000e-004**	**8.0000e-005**	**5.2000e-004**	**0.0000**	**4.3613**	**4.3613**	**2.5000e-004**	**0.0000**	**4.3678**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					4.4300e-003	0.0000	4.4300e-003	3.4000e-004	0.0000	3.4000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.9700e-003	0.0485	0.0363	6.0000e-005		1.5100e-003	1.5100e-003		1.5100e-003	1.5100e-003	0.0000	5.0671	5.0671	1.2800e-003	0.0000	5.0990
Total	**1.9700e-003**	**0.0485**	**0.0363**	**6.0000e-005**	**4.4300e-003**	**1.5100e-003**	**5.9400e-003**	**3.4000e-004**	**1.5100e-003**	**1.8500e-003**	**0.0000**	**5.0671**	**5.0671**	**1.2800e-003**	**0.0000**	**5.0990**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.3000e-004	0.0147	3.0000e-003	4.0000e-005	7.5000e-004	7.0000e-005	8.3000e-004	2.1000e-004	7.0000e-005	2.8000e-004	0.0000	3.5407	3.5407	2.2000e-004	0.0000	3.5464
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.7000e-004	4.3000e-004	4.2800e-003	1.0000e-005	8.6000e-004	1.0000e-005	8.7000e-004	2.3000e-004	1.0000e-005	2.4000e-004	0.0000	0.8206	0.8206	3.0000e-005	0.0000	0.8214
Total	**1.0000e-003**	**0.0151**	**7.2800e-003**	**5.0000e-005**	**1.6100e-003**	**8.0000e-005**	**1.7000e-003**	**4.4000e-004**	**8.0000e-005**	**5.2000e-004**	**0.0000**	**4.3613**	**4.3613**	**2.5000e-004**	**0.0000**	**4.3678**

3.3 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0217	0.2279	0.1103	1.9000e-004		0.0120	0.0120		0.0110	0.0110	0.0000	17.0843	17.0843	5.4100e-003	0.0000	17.2195
Total	**0.0217**	**0.2279**	**0.1103**	**1.9000e-004**	**0.0903**	**0.0120**	**0.1023**	**0.0497**	**0.0110**	**0.0607**	**0.0000**	**17.0843**	**17.0843**	**5.4100e-003**	**0.0000**	**17.2195**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.7000e-004	3.5000e-004	3.5000e-003	1.0000e-005	7.1000e-004	1.0000e-005	7.1000e-004	1.9000e-004	1.0000e-005	1.9000e-004	0.0000	0.6714	0.6714	3.0000e-005	0.0000	0.6721
Total	**4.7000e-004**	**3.5000e-004**	**3.5000e-003**	**1.0000e-005**	**7.1000e-004**	**1.0000e-005**	**7.1000e-004**	**1.9000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**0.6714**	**0.6714**	**3.0000e-005**	**0.0000**	**0.6721**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					0.0407	0.0000	0.0407	0.0112	0.0000	0.0112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.0500e-003	0.1686	0.1148	1.9000e-004		4.7300e-003	4.7300e-003		4.7300e-003	4.7300e-003	0.0000	17.0843	17.0843	5.4100e-003	0.0000	17.2195
Total	**6.0500e-003**	**0.1686**	**0.1148**	**1.9000e-004**	**0.0407**	**4.7300e-003**	**0.0454**	**0.0112**	**4.7300e-003**	**0.0159**	**0.0000**	**17.0843**	**17.0843**	**5.4100e-003**	**0.0000**	**17.2195**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.7000e-004	3.5000e-004	3.5000e-003	1.0000e-005	7.1000e-004	1.0000e-005	7.1000e-004	1.9000e-004	1.0000e-005	1.9000e-004	0.0000	0.6714	0.6714	3.0000e-005	0.0000	0.6721
Total	**4.7000e-004**	**3.5000e-004**	**3.5000e-003**	**1.0000e-005**	**7.1000e-004**	**1.0000e-005**	**7.1000e-004**	**1.9000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**0.6714**	**0.6714**	**3.0000e-005**	**0.0000**	**0.6721**

3.4 Grading - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0973	0.0000	0.0973	0.0369	0.0000	0.0369	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0526	0.6179	0.3551	6.8000e-004		0.0258	0.0258		0.0237	0.0237	0.0000	61.2618	61.2618	0.0194	0.0000	61.7463
Total	**0.0526**	**0.6179**	**0.3551**	**6.8000e-004**	**0.0973**	**0.0258**	**0.1230**	**0.0369**	**0.0237**	**0.0606**	**0.0000**	**61.2618**	**61.2618**	**0.0194**	**0.0000**	**61.7463**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.2600e-003	0.3202	0.0654	7.9000e-004	0.0164	1.5900e-003	0.0180	4.5100e-003	1.5200e-003	6.0300e-003	0.0000	77.1182	77.1182	4.9000e-003	0.0000	77.2406
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1100e-003	3.1000e-003	0.0308	7.0000e-005	6.2200e-003	5.0000e-005	6.2700e-003	1.6500e-003	5.0000e-005	1.7000e-003	0.0000	5.9082	5.9082	2.4000e-004	0.0000	5.9142
Total	**0.0134**	**0.3233**	**0.0962**	**8.6000e-004**	**0.0227**	**1.6400e-003**	**0.0243**	**6.1600e-003**	**1.5700e-003**	**7.7300e-003**	**0.0000**	**83.0263**	**83.0263**	**5.1400e-003**	**0.0000**	**83.1547**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					0.0438	0.0000	0.0438	8.3000e-003	0.0000	8.3000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0182	0.5504	0.3816	6.8000e-004		0.0134	0.0134		0.0134	0.0134	0.0000	61.2617	61.2617	0.0194	0.0000	61.7463
Total	**0.0182**	**0.5504**	**0.3816**	**6.8000e-004**	**0.0438**	**0.0134**	**0.0571**	**8.3000e-003**	**0.0134**	**0.0217**	**0.0000**	**61.2617**	**61.2617**	**0.0194**	**0.0000**	**61.7463**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.2600e-003	0.3202	0.0654	7.9000e-004	0.0164	1.5900e-003	0.0180	4.5100e-003	1.5200e-003	6.0300e-003	0.0000	77.1182	77.1182	4.9000e-003	0.0000	77.2406
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1100e-003	3.1000e-003	0.0308	7.0000e-005	6.2200e-003	5.0000e-005	6.2700e-003	1.6500e-003	5.0000e-005	1.7000e-003	0.0000	5.9082	5.9082	2.4000e-004	0.0000	5.9142
Total	**0.0134**	**0.3233**	**0.0962**	**8.6000e-004**	**0.0227**	**1.6400e-003**	**0.0243**	**6.1600e-003**	**1.5700e-003**	**7.7300e-003**	**0.0000**	**83.0263**	**83.0263**	**5.1400e-003**	**0.0000**	**83.1547**

3.5 Trenching - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-003	0.0193	0.0214	3.0000e-005		1.1000e-003	1.1000e-003		1.0100e-003	1.0100e-003	0.0000	2.8593	2.8593	9.0000e-004	0.0000	2.8819
Total	**1.9000e-003**	**0.0193**	**0.0214**	**3.0000e-005**		**1.1000e-003**	**1.1000e-003**		**1.0100e-003**	**1.0100e-003**	**0.0000**	**2.8593**	**2.8593**	**9.0000e-004**	**0.0000**	**2.8819**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.7000e-004	4.3000e-004	4.2800e-003	1.0000e-005	8.6000e-004	1.0000e-005	8.7000e-004	2.3000e-004	1.0000e-005	2.4000e-004	0.0000	0.8206	0.8206	3.0000e-005	0.0000	0.8214
Total	**5.7000e-004**	**4.3000e-004**	**4.2800e-003**	**1.0000e-005**	**8.6000e-004**	**1.0000e-005**	**8.7000e-004**	**2.3000e-004**	**1.0000e-005**	**2.4000e-004**	**0.0000**	**0.8206**	**0.8206**	**3.0000e-005**	**0.0000**	**0.8214**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	1.3400e-003	0.0286	0.0241	3.0000e-005		9.9000e-004	9.9000e-004		9.9000e-004	9.9000e-004	0.0000	2.8593	2.8593	9.0000e-004	0.0000	2.8819
Total	**1.3400e-003**	**0.0286**	**0.0241**	**3.0000e-005**		**9.9000e-004**	**9.9000e-004**		**9.9000e-004**	**9.9000e-004**	**0.0000**	**2.8593**	**2.8593**	**9.0000e-004**	**0.0000**	**2.8819**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.7000e-004	4.3000e-004	4.2800e-003	1.0000e-005	8.6000e-004	1.0000e-005	8.7000e-004	2.3000e-004	1.0000e-005	2.4000e-004	0.0000	0.8206	0.8206	3.0000e-005	0.0000	0.8214
Total	**5.7000e-004**	**4.3000e-004**	**4.2800e-003**	**1.0000e-005**	**8.6000e-004**	**1.0000e-005**	**8.7000e-004**	**2.3000e-004**	**1.0000e-005**	**2.4000e-004**	**0.0000**	**0.8206**	**0.8206**	**3.0000e-005**	**0.0000**	**0.8214**

3.6 Paving - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0145	0.1524	0.1467	2.3000e-004		8.2500e-003	8.2500e-003		7.5900e-003	7.5900e-003	0.0000	20.4752	20.4752	6.4800e-003	0.0000	20.6371
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0145**	**0.1524**	**0.1467**	**2.3000e-004**		**8.2500e-003**	**8.2500e-003**		**7.5900e-003**	**7.5900e-003**	**0.0000**	**20.4752**	**20.4752**	**6.4800e-003**	**0.0000**	**20.6371**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	7.3000e-004	0.0252	5.1500e-003	6.0000e-005	1.2900e-003	1.3000e-004	1.4200e-003	3.5000e-004	1.2000e-004	4.7000e-004	0.0000	6.0698	6.0698	3.9000e-004	0.0000	6.0795
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8000e-004	5.9000e-004	5.8400e-003	1.0000e-005	1.1800e-003	1.0000e-005	1.1900e-003	3.1000e-004	1.0000e-005	3.2000e-004	0.0000	1.1190	1.1190	5.0000e-005	0.0000	1.1201
Total	**1.5100e-003**	**0.0258**	**0.0110**	**7.0000e-005**	**2.4700e-003**	**1.4000e-004**	**2.6100e-003**	**6.6000e-004**	**1.3000e-004**	**7.9000e-004**	**0.0000**	**7.1888**	**7.1888**	**4.4000e-004**	**0.0000**	**7.1996**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	9.3100e-003	0.2012	0.1730	2.3000e-004		6.6700e-003	6.6700e-003		6.6700e-003	6.6700e-003	0.0000	20.4752	20.4752	6.4800e-003	0.0000	20.6371
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.3100e-003**	**0.2012**	**0.1730**	**2.3000e-004**		**6.6700e-003**	**6.6700e-003**		**6.6700e-003**	**6.6700e-003**	**0.0000**	**20.4752**	**20.4752**	**6.4800e-003**	**0.0000**	**20.6371**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	7.3000e-004	0.0252	5.1500e-003	6.0000e-005	1.2900e-003	1.3000e-004	1.4200e-003	3.5000e-004	1.2000e-004	4.7000e-004	0.0000	6.0698	6.0698	3.9000e-004	0.0000	6.0795
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8000e-004	5.9000e-004	5.8400e-003	1.0000e-005	1.1800e-003	1.0000e-005	1.1900e-003	3.1000e-004	1.0000e-005	3.2000e-004	0.0000	1.1190	1.1190	5.0000e-005	0.0000	1.1201
Total	**1.5100e-003**	**0.0258**	**0.0110**	**7.0000e-005**	**2.4700e-003**	**1.4000e-004**	**2.6100e-003**	**6.6000e-004**	**1.3000e-004**	**7.9000e-004**	**0.0000**	**7.1888**	**7.1888**	**4.4000e-004**	**0.0000**	**7.1996**

3.7 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0649	0.5797	0.4720	7.4000e-004		0.0355	0.0355		0.0334	0.0334	0.0000	64.6537	64.6537	0.0158	0.0000	65.0474
Total	**0.0649**	**0.5797**	**0.4720**	**7.4000e-004**		**0.0355**	**0.0355**		**0.0334**	**0.0334**	**0.0000**	**64.6537**	**64.6537**	**0.0158**	**0.0000**	**65.0474**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.1000e-004	7.2600e-003	1.4800e-003	2.0000e-005	1.2700e-003	4.0000e-005	1.3100e-003	3.2000e-004	3.0000e-005	3.6000e-004	0.0000	1.7492	1.7492	1.1000e-004	0.0000	1.7520
Vendor	8.3000e-004	0.0219	5.7900e-003	4.0000e-005	1.0700e-003	1.7000e-004	1.2400e-003	3.1000e-004	1.6000e-004	4.7000e-004	0.0000	4.2679	4.2679	2.8000e-004	0.0000	4.2750
Worker	3.0000e-003	2.2600e-003	0.0225	5.0000e-005	4.5300e-003	4.0000e-005	4.5700e-003	1.2100e-003	4.0000e-005	1.2400e-003	0.0000	4.3080	4.3080	1.7000e-004	0.0000	4.3124
Total	**4.0400e-003**	**0.0314**	**0.0297**	**1.1000e-004**	**6.8700e-003**	**2.5000e-004**	**7.1200e-003**	**1.8400e-003**	**2.3000e-004**	**2.0700e-003**	**0.0000**	**10.3251**	**10.3251**	**5.6000e-004**	**0.0000**	**10.3394**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0297	0.6478	0.4915	7.4000e-004		0.0249	0.0249		0.0249	0.0249	0.0000	64.6536	64.6536	0.0158	0.0000	65.0473
Total	**0.0297**	**0.6478**	**0.4915**	**7.4000e-004**		**0.0249**	**0.0249**		**0.0249**	**0.0249**	**0.0000**	**64.6536**	**64.6536**	**0.0158**	**0.0000**	**65.0473**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.1000e-004	7.2600e-003	1.4800e-003	2.0000e-005	1.2700e-003	4.0000e-005	1.3100e-003	3.2000e-004	3.0000e-005	3.6000e-004	0.0000	1.7492	1.7492	1.1000e-004	0.0000	1.7520
Vendor	8.3000e-004	0.0219	5.7900e-003	4.0000e-005	1.0700e-003	1.7000e-004	1.2400e-003	3.1000e-004	1.6000e-004	4.7000e-004	0.0000	4.2679	4.2679	2.8000e-004	0.0000	4.2750
Worker	3.0000e-003	2.2600e-003	0.0225	5.0000e-005	4.5300e-003	4.0000e-005	4.5700e-003	1.2100e-003	4.0000e-005	1.2400e-003	0.0000	4.3080	4.3080	1.7000e-004	0.0000	4.3124
Total	**4.0400e-003**	**0.0314**	**0.0297**	**1.1000e-004**	**6.8700e-003**	**2.5000e-004**	**7.1200e-003**	**1.8400e-003**	**2.3000e-004**	**2.0700e-003**	**0.0000**	**10.3251**	**10.3251**	**5.6000e-004**	**0.0000**	**10.3394**

3.7 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1855	1.6788	1.4742	2.3500e-003		0.0977	0.0977		0.0919	0.0919	0.0000	202.6587	202.6587	0.0494	0.0000	203.8948
Total	**0.1855**	**1.6788**	**1.4742**	**2.3500e-003**		**0.0977**	**0.0977**		**0.0919**	**0.0919**	**0.0000**	**202.6587**	**202.6587**	**0.0494**	**0.0000**	**203.8948**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.7000e-004	0.0211	4.3000e-003	6.0000e-005	1.4700e-003	8.0000e-005	1.5400e-003	3.9000e-004	7.0000e-005	4.7000e-004	0.0000	5.5097	5.5097	3.4000e-004	0.0000	5.5181
Vendor	2.0700e-003	0.0630	0.0159	1.4000e-004	3.4000e-003	3.4000e-004	3.7400e-003	9.8000e-004	3.2000e-004	1.3000e-003	0.0000	13.5166	13.5166	8.3000e-004	0.0000	13.5373
Worker	8.7600e-003	6.3700e-003	0.0640	1.5000e-004	0.0144	1.2000e-004	0.0145	3.8400e-003	1.1000e-004	3.9500e-003	0.0000	13.2844	13.2844	4.9000e-004	0.0000	13.2966
Total	**0.0114**	**0.0905**	**0.0842**	**3.5000e-004**	**0.0193**	**5.4000e-004**	**0.0198**	**5.2100e-003**	**5.0000e-004**	**5.7200e-003**	**0.0000**	**32.3107**	**32.3107**	**1.6600e-003**	**0.0000**	**32.3521**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0946	2.0610	1.5640	2.3500e-003		0.0791	0.0791		0.0791	0.0791	0.0000	202.6585	202.6585	0.0494	0.0000	203.8945
Total	**0.0946**	**2.0610**	**1.5640**	**2.3500e-003**		**0.0791**	**0.0791**		**0.0791**	**0.0791**	**0.0000**	**202.6585**	**202.6585**	**0.0494**	**0.0000**	**203.8945**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.7000e-004	0.0211	4.3000e-003	6.0000e-005	1.4700e-003	8.0000e-005	1.5400e-003	3.9000e-004	7.0000e-005	4.7000e-004	0.0000	5.5097	5.5097	3.4000e-004	0.0000	5.5181
Vendor	2.0700e-003	0.0630	0.0159	1.4000e-004	3.4000e-003	3.4000e-004	3.7400e-003	9.8000e-004	3.2000e-004	1.3000e-003	0.0000	13.5166	13.5166	8.3000e-004	0.0000	13.5373
Worker	8.7600e-003	6.3700e-003	0.0640	1.5000e-004	0.0144	1.2000e-004	0.0145	3.8400e-003	1.1000e-004	3.9500e-003	0.0000	13.2844	13.2844	4.9000e-004	0.0000	13.2966
Total	**0.0114**	**0.0905**	**0.0842**	**3.5000e-004**	**0.0193**	**5.4000e-004**	**0.0198**	**5.2100e-003**	**5.0000e-004**	**5.7200e-003**	**0.0000**	**32.3107**	**32.3107**	**1.6600e-003**	**0.0000**	**32.3521**

3.8 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.8308					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.6100e-003	0.0208	0.0254	4.0000e-005		1.1700e-003	1.1700e-003		1.1600e-003	1.1600e-003	0.0000	3.5072	3.5072	5.3000e-004	0.0000	3.5205
Total	**0.8334**	**0.0208**	**0.0254**	**4.0000e-005**		**1.1700e-003**	**1.1700e-003**		**1.1600e-003**	**1.1600e-003**	**0.0000**	**3.5072**	**3.5072**	**5.3000e-004**	**0.0000**	**3.5205**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1900e-003	1.5900e-003	0.0160	4.0000e-005	3.6100e-003	3.0000e-005	3.6400e-003	9.6000e-004	3.0000e-005	9.9000e-004	0.0000	3.3256	3.3256	1.2000e-004	0.0000	3.3287
Total	**2.1900e-003**	**1.5900e-003**	**0.0160**	**4.0000e-005**	**3.6100e-003**	**3.0000e-005**	**3.6400e-003**	**9.6000e-004**	**3.0000e-005**	**9.9000e-004**	**0.0000**	**3.3256**	**3.3256**	**1.2000e-004**	**0.0000**	**3.3287**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Archit. Coating	0.8308					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0343	0.0267	4.0000e-005		1.3900e-003	1.3900e-003		1.3900e-003	1.3900e-003	0.0000	3.5072	3.5072	5.3000e-004	0.0000	3.5205
Total	**0.8324**	**0.0343**	**0.0267**	**4.0000e-005**		**1.3900e-003**	**1.3900e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**3.5072**	**3.5072**	**5.3000e-004**	**0.0000**	**3.5205**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1900e-003	1.5900e-003	0.0160	4.0000e-005	3.6100e-003	3.0000e-005	3.6400e-003	9.6000e-004	3.0000e-005	9.9000e-004	0.0000	3.3256	3.3256	1.2000e-004	0.0000	3.3287
Total	**2.1900e-003**	**1.5900e-003**	**0.0160**	**4.0000e-005**	**3.6100e-003**	**3.0000e-005**	**3.6400e-003**	**9.6000e-004**	**3.0000e-005**	**9.9000e-004**	**0.0000**	**3.3256**	**3.3256**	**1.2000e-004**	**0.0000**	**3.3287**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1867	0.9313	2.0745	6.0700e-003	0.4777	6.3500e-003	0.4840	0.1286	5.9600e-003	0.1345	0.0000	557.8869	557.8869	0.0250	0.0000	558.5123
Unmitigated	0.1867	0.9313	2.0745	6.0700e-003	0.4777	6.3500e-003	0.4840	0.1286	5.9600e-003	0.1345	0.0000	557.8869	557.8869	0.0250	0.0000	558.5123

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	561.68	584.69	508.58	1,287,332	1,287,332
Total	561.68	584.69	508.58	1,287,332	1,287,332

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.578299	0.039453	0.169996	0.109068	0.028307	0.006716	0.029274	0.026666	0.003071	0.001838	0.005325	0.000874	0.001112

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	100.7936	100.7936	6.7200e-003	1.3900e-003	101.3759
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	100.7936	100.7936	6.7200e-003	1.3900e-003	101.3759
NaturalGas Mitigated	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	113.1954	113.1954	2.1700e-003	2.0800e-003	113.8681
NaturalGas Unmitigated	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	113.1954	113.1954	2.1700e-003	2.0800e-003	113.8681

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	2.1212e+006	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	113.1954	113.1954	2.1700e-003	2.0800e-003	113.8681
Total		**0.0114**	**0.0977**	**0.0416**	**6.2000e-004**		**7.9000e-003**	**7.9000e-003**		**7.9000e-003**	**7.9000e-003**	**0.0000**	**113.1954**	**113.1954**	**2.1700e-003**	**2.0800e-003**	**113.8681**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	2.1212e+006	0.0114	0.0977	0.0416	6.2000e-004		7.9000e-003	7.9000e-003		7.9000e-003	7.9000e-003	0.0000	113.1954	113.1954	2.1700e-003	2.0800e-003	113.8681
Total		**0.0114**	**0.0977**	**0.0416**	**6.2000e-004**		**7.9000e-003**	**7.9000e-003**		**7.9000e-003**	**7.9000e-003**	**0.0000**	**113.1954**	**113.1954**	**2.1700e-003**	**2.0800e-003**	**113.8681**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	510832	100.7936	6.7200e-003	1.3900e-003	101.3759
Total		**100.7936**	**6.7200e-003**	**1.3900e-003**	**101.3759**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	510832	100.7936	6.7200e-003	1.3900e-003	101.3759
Total		**100.7936**	**6.7200e-003**	**1.3900e-003**	**101.3759**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.9050	0.0127	0.9447	1.0700e-003		0.0753	0.0753		0.0753	0.0753	7.4996	2.5570	10.0565	0.0149	4.3000e-004	10.5559
Unmitigated	0.9050	0.0127	0.9447	1.0700e-003		0.0753	0.0753		0.0753	0.0753	7.4996	2.5570	10.0565	0.0149	4.3000e-004	10.5559

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0831					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4609					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.3477	7.6200e-003	0.5057	1.0400e-003		0.0729	0.0729		0.0729	0.0729	7.4996	1.8414	9.3409	0.0142	4.3000e-004	9.8229
Landscaping	0.0133	5.0700e-003	0.4390	2.0000e-005		2.4200e-003	2.4200e-003		2.4200e-003	2.4200e-003	0.0000	0.7156	0.7156	6.9000e-004	0.0000	0.7329
Total	**0.9050**	**0.0127**	**0.9447**	**1.0600e-003**		**0.0753**	**0.0753**		**0.0753**	**0.0753**	**7.4996**	**2.5570**	**10.0565**	**0.0149**	**4.3000e-004**	**10.5559**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0831					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4609					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Hearth	0.3477	7.6200e-003	0.5057	1.0400e-003		0.0729	0.0729		0.0729	0.0729	7.4996	1.8414	9.3409	0.0142	4.3000e-004	9.8229
Landscaping	0.0133	5.0700e-003	0.4390	2.0000e-005		2.4200e-003	2.4200e-003		2.4200e-003	2.4200e-003	0.0000	0.7156	0.7156	6.9000e-004	0.0000	0.7329
Total	**0.9050**	**0.0127**	**0.9447**	**1.0600e-003**		**0.0753**	**0.0753**		**0.0753**	**0.0753**	**7.4996**	**2.5570**	**10.0565**	**0.0149**	**4.3000e-004**	**10.5559**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	6.9973	0.1256	3.0400e-003	11.0436
Unmitigated	6.9973	0.1256	3.0400e-003	11.0436

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	3.84409 / 2.42345	6.9973	0.1256	3.0400e-003	11.0436
Total		**6.9973**	**0.1256**	**3.0400e-003**	**11.0436**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	3.84409 / 2.42345	6.9973	0.1256	3.0400e-003	11.0436
Total		**6.9973**	**0.1256**	**3.0400e-003**	**11.0436**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	14.4083	0.8515	0.0000	35.6960
Unmitigated	14.4083	0.8515	0.0000	35.6960

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	70.98	14.4083	0.8515	0.0000	35.6960
Total		**14.4083**	**0.8515**	**0.0000**	**35.6960**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	70.98	14.4083	0.8515	0.0000	35.6960
Total		**14.4083**	**0.8515**	**0.0000**	**35.6960**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

TAC Analysis Only

Penstemen Place, TAC

Sonoma-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	59.00	Dwelling Unit	9.70	118,017.00	169

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	75
Climate Zone	4			**Operational Year**	2021
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - use PG&E default

Land Use - Based on application and project descrition

Construction Phase - Based on applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Off-road Equipment - Applicant provided information

Trips and VMT - 78 round tripds during paving
Demolition - Used Google earth polygon tool to quantify demlition square footage

Grading - 15860 cy of material exported

Woodstoves - No wood burning

Construction Off-road Equipment Mitigation - Best Managemnt Practices
Tier 2 Mitigation, DPF Level 3

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	15
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
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tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00

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tblConstEquipMitigation	Tier	No Change	Tier 2
tblConstEquipMitigation	Tier	No Change	Tier 2
tblConstructionPhase	NumDays	20.00	230.00
tblConstructionPhase	NumDays	20.00	22.00
tblConstructionPhase	NumDays	20.00	88.00
tblGrading	MaterialExported	0.00	15,860.00
tblLandUse	BuildingSpaceSquareFeet	106,200.00	118,017.00
tblLandUse	LandUseSquareFeet	106,200.00	118,017.00
tblLandUse	LotAcreage	19.16	9.70

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	0.50
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblOffRoadEquipment	UsageHours	8.00	1.80
tblProjectCharacteristics	OperationalYear	2018	2021
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripLength	20.00	0.50
tblTripsAndVMT	HaulingTripNumber	1,983.00	1,982.00
tblTripsAndVMT	HaulingTripNumber	0.00	156.00
tblTripsAndVMT	HaulingTripNumber	0.00	188.00
tblTripsAndVMT	VendorTripLength	7.30	0.50
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tblTripsAndVMT	VendorTripLength	7.30	0.50
tblTripsAndVMT	VendorTripLength	7.30	0.50
tblTripsAndVMT	VendorTripLength	7.30	0.50
tblTripsAndVMT	VendorTripLength	7.30	0.50
tblTripsAndVMT	VendorTripLength	7.30	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50

tblTripsAndVMT	WorkerTripLength	10.80	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50
tblTripsAndVMT	WorkerTripLength	10.80	0.50

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.1666	1.7752	1.1796	2.0600e-003	0.1987	0.0855	0.2842	0.0884	0.0794	0.1678	0.0000	184.1531	184.1531	0.0516	0.0000	185.4437
2020	1.0232	1.7431	1.5292	2.4500e-003	1.1400e-003	0.0990	0.1001	3.1000e-004	0.0931	0.0935	0.0000	211.1238	211.1238	0.0507	0.0000	212.3916
Maximum	**1.0232**	**1.7752**	**1.5292**	**2.4500e-003**	**0.1987**	**0.0990**	**0.2842**	**0.0884**	**0.0931**	**0.1678**	**0.0000**	**211.1238**	**211.1238**	**0.0516**	**0.0000**	**212.3916**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0724	1.7718	1.2617	2.0600e-003	0.0901	8.0500e-003	0.0982	0.0202	8.0400e-003	0.0282	0.0000	184.1528	184.1528	0.0516	0.0000	185.4435
2020	0.9313	2.1389	1.6202	2.4500e-003	1.1400e-003	0.0122	0.0133	3.1000e-004	0.0121	0.0125	0.0000	211.1236	211.1236	0.0507	0.0000	212.3914

Maximum	**0.9313**	**2.1389**	**1.6202**	**2.4500e-003**	**0.0901**	**0.0122**	**0.0982**	**0.0202**	**0.0121**	**0.0282**	**0.0000**	**211.1236**	**211.1236**	**0.0516**	**0.0000**	**212.3914**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**15.64**	**-11.15**	**-6.39**	**0.00**	**54.34**	**89.05**	**71.00**	**76.93**	**88.31**	**84.44**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**4-1-2019**	**6-30-2019**	0.6053	0.4858
2	**7-1-2019**	**9-30-2019**	0.5932	0.5644
3	**10-1-2019**	**12-31-2019**	0.7287	0.7787
4	**1-1-2020**	**3-31-2020**	0.9513	1.0631
5	**4-1-2020**	**6-30-2020**	0.9518	1.0636
6	**7-1-2020**	**9-30-2020**	0.7360	0.8145
		Highest	0.9518	1.0636

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	4/1/2019	4/30/2019	5	22	
2	Site Preparation	Site Preparation	5/1/2019	5/14/2019	5	10	
3	Grading	Grading	5/15/2019	9/13/2019	5	88	
4	Trenching	Trenching	7/15/2019	9/12/2019	5	44	
5	Paving	Paving	9/15/2019	10/11/2019	5	20	
6	Building Construction	Building Construction	10/16/2019	9/1/2020	5	230	
7	Architectural Coating	Architectural Coating	1/1/2020	11/17/2020	5	230	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 69.3

Acres of Paving: 0

Residential Indoor: 238,984; Residential Outdoor: 79,661; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	1.80	81	0.73
Demolition	Excavators	1	1.80	158	0.38
Demolition	Rubber Tired Dozers	1	1.80	247	0.40
Demolition	Tractors/Loaders/Backhoes	1	1.80	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	1.80	158	0.38
Grading	Graders	1	1.80	187	0.41
Grading	Rubber Tired Dozers	1	1.80	247	0.40
Grading	Scrapers	3	1.80	367	0.48
Grading	Tractors/Loaders/Backhoes	1	1.80	97	0.37
Trenching	Excavators	1	1.40	158	0.38
Trenching	Tractors/Loaders/Backhoes	1	1.40	97	0.37
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Architectural Coating	Aerial Lifts	1	0.50	63	0.31
Architectural Coating	Air Compressors	1	0.50	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	91.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT

Site Preparation	7	18.00	0.00	0.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT
Grading	7	18.00	0.00	1,982.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT
Trenching	2	5.00	0.00	0.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	156.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT
Building Construction	9	21.00	6.00	188.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT
Architectural Coating	2	4.00	0.00	0.00	0.50	0.50	0.50	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.8400e-003	0.0000	9.8400e-003	1.4900e-003	0.0000	1.4900e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1700e-003	0.0512	0.0335	6.0000e-005		2.7300e-003	2.7300e-003		2.5600e-003	2.5600e-003	0.0000	5.0671	5.0671	1.2800e-003	0.0000	5.0990
Total	**5.1700e-003**	**0.0512**	**0.0335**	**6.0000e-005**	**9.8400e-003**	**2.7300e-003**	**0.0126**	**1.4900e-003**	**2.5600e-003**	**4.0500e-003**	**0.0000**	**5.0671**	**5.0671**	**1.2800e-003**	**0.0000**	**5.0990**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-004	4.5600e-003	8.0000e-004	0.0000	2.0000e-005	1.0000e-005	3.0000e-005	1.0000e-005	1.0000e-005	1.0000e-005	0.0000	0.4324	0.4324	9.0000e-005	0.0000	0.4345
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	8.0000e-005	1.0400e-003	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0605	0.0605	1.0000e-005	0.0000	0.0606
Total	**2.8000e-004**	**4.6400e-003**	**1.8400e-003**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**7.0000e-005**	**2.0000e-005**	**1.0000e-005**	**2.0000e-005**	**0.0000**	**0.4928**	**0.4928**	**1.0000e-004**	**0.0000**	**0.4951**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.4300e-003	0.0000	4.4300e-003	3.4000e-004	0.0000	3.4000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.9700e-003	0.0485	0.0363	6.0000e-005		2.3000e-004	2.3000e-004		2.3000e-004	2.3000e-004	0.0000	5.0671	5.0671	1.2800e-003	0.0000	5.0990
Total	**1.9700e-003**	**0.0485**	**0.0363**	**6.0000e-005**	**4.4300e-003**	**2.3000e-004**	**4.6600e-003**	**3.4000e-004**	**2.3000e-004**	**5.7000e-004**	**0.0000**	**5.0671**	**5.0671**	**1.2800e-003**	**0.0000**	**5.0990**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	1.0000e-004	4.5600e-003	8.0000e-004	0.0000	2.0000e-005	1.0000e-005	3.0000e-005	1.0000e-005	1.0000e-005	1.0000e-005	0.0000	0.4324	0.4324	9.0000e-005	0.0000	0.4345
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	8.0000e-005	1.0400e-003	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0605	0.0605	1.0000e-005	0.0000	0.0606
Total	**2.8000e-004**	**4.6400e-003**	**1.8400e-003**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**7.0000e-005**	**2.0000e-005**	**1.0000e-005**	**2.0000e-005**	**0.0000**	**0.4928**	**0.4928**	**1.0000e-004**	**0.0000**	**0.4951**

3.3 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0217	0.2279	0.1103	1.9000e-004		0.0120	0.0120		0.0110	0.0110	0.0000	17.0843	17.0843	5.4100e-003	0.0000	17.2195
Total	**0.0217**	**0.2279**	**0.1103**	**1.9000e-004**	**0.0903**	**0.0120**	**0.1023**	**0.0497**	**0.0110**	**0.0607**	**0.0000**	**17.0843**	**17.0843**	**5.4100e-003**	**0.0000**	**17.2195**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	6.0000e-005	8.5000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0495	0.0495	0.0000	0.0000	0.0496
Total	**1.4000e-004**	**6.0000e-005**	**8.5000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0495**	**0.0495**	**0.0000**	**0.0000**	**0.0496**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0407	0.0000	0.0407	0.0112	0.0000	0.0112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.0500e-003	0.1686	0.1148	1.9000e-004		7.1000e-004	7.1000e-004		7.1000e-004	7.1000e-004	0.0000	17.0843	17.0843	5.4100e-003	0.0000	17.2195
Total	**6.0500e-003**	**0.1686**	**0.1148**	**1.9000e-004**	**0.0407**	**7.1000e-004**	**0.0414**	**0.0112**	**7.1000e-004**	**0.0119**	**0.0000**	**17.0843**	**17.0843**	**5.4100e-003**	**0.0000**	**17.2195**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	6.0000e-005	8.5000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0495	0.0495	0.0000	0.0000	0.0496
Total	**1.4000e-004**	**6.0000e-005**	**8.5000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0495**	**0.0495**	**0.0000**	**0.0000**	**0.0496**

3.4 Grading - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0973	0.0000	0.0973	0.0369	0.0000	0.0369	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0526	0.6179	0.3551	6.8000e-004		0.0258	0.0258		0.0237	0.0237	0.0000	61.2618	61.2618	0.0194	0.0000	61.7463
Total	**0.0526**	**0.6179**	**0.3551**	**6.8000e-004**	**0.0973**	**0.0258**	**0.1230**	**0.0369**	**0.0237**	**0.0606**	**0.0000**	**61.2618**	**61.2618**	**0.0194**	**0.0000**	**61.7463**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.2400e-003	0.0994	0.0175	1.0000e-004	4.3000e-004	1.7000e-004	6.0000e-004	1.2000e-004	1.6000e-004	2.8000e-004	0.0000	9.4167	9.4167	1.8800e-003	0.0000	9.4637
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2600e-003	5.5000e-004	7.4700e-003	0.0000	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.4355	0.4355	4.0000e-005	0.0000	0.4365
Total	**3.5000e-003**	**0.1000**	**0.0249**	**1.0000e-004**	**7.3000e-004**	**1.8000e-004**	**9.0000e-004**	**2.0000e-004**	**1.7000e-004**	**3.7000e-004**	**0.0000**	**9.8522**	**9.8522**	**1.9200e-003**	**0.0000**	**9.9002**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0438	0.0000	0.0438	8.3000e-003	0.0000	8.3000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.0182	0.5504	0.3816	6.8000e-004		2.0000e-003	2.0000e-003		2.0000e-003	2.0000e-003	0.0000	61.2617	61.2617	0.0194	0.0000	61.7463
Total	**0.0182**	**0.5504**	**0.3816**	**6.8000e-004**	**0.0438**	**2.0000e-003**	**0.0458**	**8.3000e-003**	**2.0000e-003**	**0.0103**	**0.0000**	**61.2617**	**61.2617**	**0.0194**	**0.0000**	**61.7463**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.2400e-003	0.0994	0.0175	1.0000e-004	4.3000e-004	1.7000e-004	6.0000e-004	1.2000e-004	1.6000e-004	2.8000e-004	0.0000	9.4167	9.4167	1.8800e-003	0.0000	9.4637
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2600e-003	5.5000e-004	7.4700e-003	0.0000	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.4355	0.4355	4.0000e-005	0.0000	0.4365
Total	**3.5000e-003**	**0.1000**	**0.0249**	**1.0000e-004**	**7.3000e-004**	**1.8000e-004**	**9.0000e-004**	**2.0000e-004**	**1.7000e-004**	**3.7000e-004**	**0.0000**	**9.8522**	**9.8522**	**1.9200e-003**	**0.0000**	**9.9002**

3.5 Trenching - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-003	0.0193	0.0214	3.0000e-005		1.1000e-003	1.1000e-003		1.0100e-003	1.0100e-003	0.0000	2.8593	2.8593	9.0000e-004	0.0000	2.8819
Total	**1.9000e-003**	**0.0193**	**0.0214**	**3.0000e-005**		**1.1000e-003**	**1.1000e-003**		**1.0100e-003**	**1.0100e-003**	**0.0000**	**2.8593**	**2.8593**	**9.0000e-004**	**0.0000**	**2.8819**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	8.0000e-005	1.0400e-003	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0605	0.0605	1.0000e-005	0.0000	0.0606
Total	**1.8000e-004**	**8.0000e-005**	**1.0400e-003**	**0.0000**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0605**	**0.0605**	**1.0000e-005**	**0.0000**	**0.0606**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3400e-003	0.0286	0.0241	3.0000e-005		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	2.8593	2.8593	9.0000e-004	0.0000	2.8819
Total	**1.3400e-003**	**0.0286**	**0.0241**	**3.0000e-005**		**1.5000e-004**	**1.5000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**2.8593**	**2.8593**	**9.0000e-004**	**0.0000**	**2.8819**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8000e-004	8.0000e-005	1.0400e-003	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0605	0.0605	1.0000e-005	0.0000	0.0606
Total	**1.8000e-004**	**8.0000e-005**	**1.0400e-003**	**0.0000**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0605**	**0.0605**	**1.0000e-005**	**0.0000**	**0.0606**

3.6 Paving - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0145	0.1524	0.1467	2.3000e-004		8.2500e-003	8.2500e-003		7.5900e-003	7.5900e-003	0.0000	20.4752	20.4752	6.4800e-003	0.0000	20.6371
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0145**	**0.1524**	**0.1467**	**2.3000e-004**		**8.2500e-003**	**8.2500e-003**		**7.5900e-003**	**7.5900e-003**	**0.0000**	**20.4752**	**20.4752**	**6.4800e-003**	**0.0000**	**20.6371**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8000e-004	7.8300e-003	1.3700e-003	1.0000e-005	3.0000e-005	1.0000e-005	5.0000e-005	1.0000e-005	1.0000e-005	2.0000e-005	0.0000	0.7412	0.7412	1.5000e-004	0.0000	0.7449
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.4000e-004	1.0000e-004	1.4100e-003	0.0000	6.0000e-005	0.0000	6.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0825	0.0825	1.0000e-005	0.0000	0.0827
Total	**4.2000e-004**	**7.9300e-003**	**2.7800e-003**	**1.0000e-005**	**9.0000e-005**	**1.0000e-005**	**1.1000e-004**	**3.0000e-005**	**1.0000e-005**	**4.0000e-005**	**0.0000**	**0.8237**	**0.8237**	**1.6000e-004**	**0.0000**	**0.8276**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.3100e-003	0.2012	0.1730	2.3000e-004		1.0000e-003	1.0000e-003		1.0000e-003	1.0000e-003	0.0000	20.4752	20.4752	6.4800e-003	0.0000	20.6371
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.3100e-003**	**0.2012**	**0.1730**	**2.3000e-004**		**1.0000e-003**	**1.0000e-003**		**1.0000e-003**	**1.0000e-003**	**0.0000**	**20.4752**	**20.4752**	**6.4800e-003**	**0.0000**	**20.6371**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8000e-004	7.8300e-003	1.3700e-003	1.0000e-005	3.0000e-005	1.0000e-005	5.0000e-005	1.0000e-005	1.0000e-005	2.0000e-005	0.0000	0.7412	0.7412	1.5000e-004	0.0000	0.7449
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.4000e-004	1.0000e-004	1.4100e-003	0.0000	6.0000e-005	0.0000	6.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0825	0.0825	1.0000e-005	0.0000	0.0827
Total	**4.2000e-004**	**7.9300e-003**	**2.7800e-003**	**1.0000e-005**	**9.0000e-005**	**1.0000e-005**	**1.1000e-004**	**3.0000e-005**	**1.0000e-005**	**4.0000e-005**	**0.0000**	**0.8237**	**0.8237**	**1.6000e-004**	**0.0000**	**0.8276**

3.7 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0649	0.5797	0.4720	7.4000e-004		0.0355	0.0355		0.0334	0.0334	0.0000	64.6537	64.6537	0.0158	0.0000	65.0474
Total	**0.0649**	**0.5797**	**0.4720**	**7.4000e-004**		**0.0355**	**0.0355**		**0.0334**	**0.0334**	**0.0000**	**64.6537**	**64.6537**	**0.0158**	**0.0000**	**65.0474**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	2.2600e-003	4.0000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2136	0.2136	4.0000e-005	0.0000	0.2147
Vendor	3.3000e-004	0.0115	3.2400e-003	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-004	2.0000e-005	2.0000e-005	5.0000e-005	0.0000	0.9419	0.9419	1.8000e-004	0.0000	0.9463
Worker	9.2000e-004	4.0000e-004	5.4500e-003	0.0000	2.2000e-004	1.0000e-005	2.2000e-004	6.0000e-005	1.0000e-005	6.0000e-005	0.0000	0.3176	0.3176	3.0000e-005	0.0000	0.3183
Total	**1.3000e-003**	**0.0141**	**9.0900e-003**	**1.0000e-005**	**3.3000e-004**	**3.0000e-005**	**3.6000e-004**	**9.0000e-005**	**3.0000e-005**	**1.2000e-004**	**0.0000**	**1.4730**	**1.4730**	**2.5000e-004**	**0.0000**	**1.4793**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0297	0.6478	0.4915	7.4000e-004		3.7300e-003	3.7300e-003		3.7300e-003	3.7300e-003	0.0000	64.6536	64.6536	0.0158	0.0000	65.0473

Total	**0.0297**	**0.6478**	**0.4915**	**7.4000e-004**		**3.7300e-003**	**3.7300e-003**		**3.7300e-003**	**3.7300e-003**	**0.0000**	**64.6536**	**64.6536**	**0.0158**	**0.0000**	**65.0473**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	2.2600e-003	4.0000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2136	0.2136	4.0000e-005	0.0000	0.2147
Vendor	3.3000e-004	0.0115	3.2400e-003	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-004	2.0000e-005	2.0000e-005	5.0000e-005	0.0000	0.9419	0.9419	1.8000e-004	0.0000	0.9463
Worker	9.2000e-004	4.0000e-004	5.4500e-003	0.0000	2.2000e-004	1.0000e-005	2.2000e-004	6.0000e-005	1.0000e-005	6.0000e-005	0.0000	0.3176	0.3176	3.0000e-005	0.0000	0.3183
Total	**1.3000e-003**	**0.0141**	**9.0900e-003**	**1.0000e-005**	**3.3000e-004**	**3.0000e-005**	**3.6000e-004**	**9.0000e-005**	**3.0000e-005**	**1.2000e-004**	**0.0000**	**1.4730**	**1.4730**	**2.5000e-004**	**0.0000**	**1.4793**

3.7 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1855	1.6788	1.4742	2.3500e-003		0.0977	0.0977		0.0919	0.0919	0.0000	202.6587	202.6587	0.0494	0.0000	203.8948
Total	**0.1855**	**1.6788**	**1.4742**	**2.3500e-003**		**0.0977**	**0.0977**		**0.0919**	**0.0919**	**0.0000**	**202.6587**	**202.6587**	**0.0494**	**0.0000**	**203.8948**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3000e-004	6.9100e-003	1.0900e-003	1.0000e-005	4.0000e-005	1.0000e-005	5.0000e-005	1.0000e-005	1.0000e-005	2.0000e-005	0.0000	0.6919	0.6919	1.2000e-004	0.0000	0.6949
Vendor	8.7000e-004	0.0352	9.0300e-003	3.0000e-005	2.5000e-004	5.0000e-005	2.9000e-004	7.0000e-005	5.0000e-005	1.2000e-004	0.0000	3.0396	3.0396	5.1000e-004	0.0000	3.0524
Worker	2.6700e-003	1.1200e-003	0.0155	1.0000e-005	6.8000e-004	2.0000e-005	7.0000e-004	1.8000e-004	2.0000e-005	2.0000e-004	0.0000	0.9809	0.9809	8.0000e-005	0.0000	0.9829
Total	**3.6700e-003**	**0.0433**	**0.0256**	**5.0000e-005**	**9.7000e-004**	**8.0000e-005**	**1.0400e-003**	**2.6000e-004**	**8.0000e-005**	**3.4000e-004**	**0.0000**	**4.7123**	**4.7123**	**7.1000e-004**	**0.0000**	**4.7302**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0946	2.0610	1.5640	2.3500e-003		0.0119	0.0119		0.0119	0.0119	0.0000	202.6585	202.6585	0.0494	0.0000	203.8945
Total	**0.0946**	**2.0610**	**1.5640**	**2.3500e-003**		**0.0119**	**0.0119**		**0.0119**	**0.0119**	**0.0000**	**202.6585**	**202.6585**	**0.0494**	**0.0000**	**203.8945**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	1.3000e-004	6.9100e-003	1.0900e-003	1.0000e-005	4.0000e-005	1.0000e-005	5.0000e-005	1.0000e-005	1.0000e-005	2.0000e-005	0.0000	0.6919	0.6919	1.2000e-004	0.0000	0.6949
Vendor	8.7000e-004	0.0352	9.0300e-003	3.0000e-005	2.5000e-004	5.0000e-005	2.9000e-004	7.0000e-005	5.0000e-005	1.2000e-004	0.0000	3.0396	3.0396	5.1000e-004	0.0000	3.0524
Worker	2.6700e-003	1.1200e-003	0.0155	1.0000e-005	6.8000e-004	2.0000e-005	7.0000e-004	1.8000e-004	2.0000e-005	2.0000e-004	0.0000	0.9809	0.9809	8.0000e-005	0.0000	0.9829
Total	**3.6700e-003**	**0.0433**	**0.0256**	**5.0000e-005**	**9.7000e-004**	**8.0000e-005**	**1.0400e-003**	**2.6000e-004**	**8.0000e-005**	**3.4000e-004**	**0.0000**	**4.7123**	**4.7123**	**7.1000e-004**	**0.0000**	**4.7302**

3.8 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.8308					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.6100e-003	0.0208	0.0254	4.0000e-005		1.1700e-003	1.1700e-003		1.1600e-003	1.1600e-003	0.0000	3.5072	3.5072	5.3000e-004	0.0000	3.5205
Total	**0.8334**	**0.0208**	**0.0254**	**4.0000e-005**		**1.1700e-003**	**1.1700e-003**		**1.1600e-003**	**1.1600e-003**	**0.0000**	**3.5072**	**3.5072**	**5.3000e-004**	**0.0000**	**3.5205**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	2.8000e-004	3.8800e-003	0.0000	1.7000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.2456	0.2456	2.0000e-005	0.0000	0.2461
Total	**6.7000e-004**	**2.8000e-004**	**3.8800e-003**	**0.0000**	**1.7000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2456**	**0.2456**	**2.0000e-005**	**0.0000**	**0.2461**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.8308					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0343	0.0267	4.0000e-005		2.1000e-004	2.1000e-004		2.1000e-004	2.1000e-004	0.0000	3.5072	3.5072	5.3000e-004	0.0000	3.5205
Total	**0.8324**	**0.0343**	**0.0267**	**4.0000e-005**		**2.1000e-004**	**2.1000e-004**		**2.1000e-004**	**2.1000e-004**	**0.0000**	**3.5072**	**3.5072**	**5.3000e-004**	**0.0000**	**3.5205**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	2.8000e-004	3.8800e-003	0.0000	1.7000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.2456	0.2456	2.0000e-005	0.0000	0.2461
Total	**6.7000e-004**	**2.8000e-004**	**3.8800e-003**	**0.0000**	**1.7000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2456**	**0.2456**	**2.0000e-005**	**0.0000**	**0.2461**

Penstemon Place, Santa Rosa, CA

DPM Emissions and Modeling Emission Rates

Emissions Model Year	Activity	DPM (ton/year)	Area Source	DPM Emissions (lb/yr)	(lb/hr)	(g/s)	Modeled Area (m^2)	DPM Emission Rate ($g/s/m^2$)
2017	Construction	0.0855	DPM	171.0	0.04685	5.90E-03	39,595	1.49E-07
2018	Construction	0.0990	DPM	198.0	0.05425	6.84E-03	39,595	1.73E-07
Total		***0.1845***		***369.0***	***0.1011***	***0.0127***		

Operation Hours

hr/day =	10	(8am - 6pm)
days/yr =	365	
hours/year =	3650	

Penstemon Place, Santa Rosa, CA

PM2.5 Fugitive Dust Emissions for Modeling

Construction Year	Activity	Area Source	PM2.5 Emissions (ton/year)	(lb/yr)	(lb/hr)	(g/s)	Modeled Area (m^2)	PM2.5 Emission Rate $g/s/m^2$
2017	Construction	FUG	0.0884	176.8	0.04844	6.10E-03	39,595	1.54E-07
2018	Construction	FUG	0.0003	0.6	0.00017	2.14E-05	39,595	5.41E-10
Total			***0.0887***	***177.4***	***0.0486***	***0.0061***		

Operation Hours

hr/day =	10	(8am - 6pm)
days/yr =	365	
hours/year =	3650	

Penstemon Place, Santa Rosa, CA
Maximum DPM Cancer Risk Calculations From Construction
Impacts at Off-Site Receptors-1.5 meter

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	0.85	0.85	0.72	0.72	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

			Infant/Child - Exposure Information				Adult - Exposure Information					
			DPM Conc (ug/m3)		Age	Infant/Child	Modeled DPM Conc (ug/m3)		Age	Adult		
Exposure Year	**Exposure Duration (years)**	**Age**	**Year**	**Annual**	**Sensitivity Factor**	**Cancer Risk (per million)**	**Year**	**Annual**	**Sensitivity Factor**	**Cancer Risk (per million)**	**Fugitive PM2.5**	**Total PM2.5**
0	0.25	-0.25 - 0*	2019	0.0000	10	0.00	2019	0.0000	-	-		
1	1	0 - 1	2019	0.1960	10	27.36	2019	0.1960	1	0.56	0.4008	0.597
2	1	1 - 2	2020	0.2276	10	31.78	2020	0.2276	1	0.65	0.0014	0.229
3	1	2 - 3		0.0000	3	0.00		0.0000	1	0.00		
4	1	3 - 4		0.0000	3	0.00		0.0000	1	0.00		
5	1	4 - 5		0.0000	3	0.00		0.0000	1	0.00		
6	1	5 - 6		0.0000	3	0.00		0.0000	1	0.00		
7	1	6 - 7		0.0000	3	0.00		0.0000	1	0.00		
8	1	7 - 8		0.0000	3	0.00		0.0000	1	0.00		
9	1	8 - 9		0.0000	3	0.00		0.0000	1	0.00		
10	1	9 - 10		0.0000	3	0.00		0.0000	1	0.00		
11	1	10 - 11		0.0000	3	0.00		0.0000	1	0.00		
12	1	11 - 12		0.0000	3	0.00		0.0000	1	0.00		
13	1	12 - 13		0.0000	3	0.00		0.0000	1	0.00		
14	1	13 - 14		0.0000	3	0.00		0.0000	1	0.00		
15	1	14 - 15		0.0000	3	0.00		0.0000	1	0.00		
16	1	15 - 16		0.0000	3	0.00		0.0000	1	0.00		
17	1	16-17		0.0000	1	0.00		0.0000	1	0.00		
18	1	17-18		0.0000	1	0.00		0.0000	1	0.00		
19	1	18-19		0.0000	1	0.00		0.0000	1	0.00		
20	1	19-20		0.0000	1	0.00		0.0000	1	0.00		
21	1	20-21		0.0000	1	0.00		0.0000	1	0.00		
22	1	21-22		0.0000	1	0.00		0.0000	1	0.00		
23	1	22-23		0.0000	1	0.00		0.0000	1	0.00		
24	1	23-24		0.0000	1	0.00		0.0000	1	0.00		
25	1	24-25		0.0000	1	0.00		0.0000	1	0.00		
26	1	25-26		0.0000	1	0.00		0.0000	1	0.00		
27	1	26-27		0.0000	1	0.00		0.0000	1	0.00		
28	1	27-28		0.0000	1	0.00		0.0000	1	0.00		
29	1	28-29		0.0000	1	0.00		0.0000	1	0.00		
30	1	29-30		0.0000	1	0.00		0.0000	1	0.00		
Total Increased Cancer Risk						**59.14**				**1.22**		

* Third trimester of pregnancy

Penstemon Place, Santa Rosa, CA
Maximum DPM Cancer Risk Calculations From Construction
Impacts at Off-Site Receptors-1.5 meter

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	0.85	0.85	0.72	0.72	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

			Infant/Child - Exposure Information				Adult - Exposure Information					
			DPM Conc (ug/m3)				Modeled DPM Conc (ug/m3)					
Exposure Year	**Exposure Duration (years)**	**Age**	**Year**	**Annual**	**Age Sensitivity Factor**	**Infant/Child Cancer Risk (per million)**	**Year**	**Annual**	**Age Sensitivity Factor**	**Adult Cancer Risk (per million)**	**Fugitive PM2.5**	**Total PM2.5**
0	0.25	-0.25 - 0*	2019	0.0000	10	0.00	2019	0.0000	-	-		
1	1	0 - 1	2019	0.1852	10	25.85	2019	0.1852	1	0.53	0.4257	0.611
2	1	1 - 2	2020	0.2150	10	30.01	2020	0.2150	1	0.62	0.0015	0.216
3	1	2 - 3		0.0000	3	0.00		0.0000	1	0.00		
4	1	3 - 4		0.0000	3	0.00		0.0000	1	0.00		
5	1	4 - 5		0.0000	3	0.00		0.0000	1	0.00		
6	1	5 - 6		0.0000	3	0.00		0.0000	1	0.00		
7	1	6 - 7		0.0000	3	0.00		0.0000	1	0.00		
8	1	7 - 8		0.0000	3	0.00		0.0000	1	0.00		
9	1	8 - 9		0.0000	3	0.00		0.0000	1	0.00		
10	1	9 - 10		0.0000	3	0.00		0.0000	1	0.00		
11	1	10 - 11		0.0000	3	0.00		0.0000	1	0.00		
12	1	11 - 12		0.0000	3	0.00		0.0000	1	0.00		
13	1	12 - 13		0.0000	3	0.00		0.0000	1	0.00		
14	1	13 - 14		0.0000	3	0.00		0.0000	1	0.00		
15	1	14 - 15		0.0000	3	0.00		0.0000	1	0.00		
16	1	15 - 16		0.0000	3	0.00		0.0000	1	0.00		
17	1	16-17		0.0000	1	0.00		0.0000	1	0.00		
18	1	17-18		0.0000	1	0.00		0.0000	1	0.00		
19	1	18-19		0.0000	1	0.00		0.0000	1	0.00		
20	1	19-20		0.0000	1	0.00		0.0000	1	0.00		
21	1	20-21		0.0000	1	0.00		0.0000	1	0.00		
22	1	21-22		0.0000	1	0.00		0.0000	1	0.00		
23	1	22-23		0.0000	1	0.00		0.0000	1	0.00		
24	1	23-24		0.0000	1	0.00		0.0000	1	0.00		
25	1	24-25		0.0000	1	0.00		0.0000	1	0.00		
26	1	25-26		0.0000	1	0.00		0.0000	1	0.00		
27	1	26-27		0.0000	1	0.00		0.0000	1	0.00		
28	1	27-28		0.0000	1	0.00		0.0000	1	0.00		
29	1	28-29		0.0000	1	0.00		0.0000	1	0.00		
30	1	29-30		0.0000	1	0.00		0.0000	1	0.00		
Total Increased Cancer Risk						**55.86**				**1.15**		

* Third trimester of pregnancy

Penstemon Place, Santa Rosa, CA - Health Impact Summary

Maximum Impacts at Construction MEI Location

Emissions Year	Maximum Concentrations Exhaust PM10/DPM ($\mu g/m^3$)	Maximum Concentrations Fugitive PM2.5 ($\mu g/m^3$)	Cancer Risk (per million) Child	Cancer Risk (per million) Adult	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2017	0.1960	0.4008	27.4	0.6	0.039	0.60
2018	0.2276	0.0014	31.8	0.7	0.046	0.23
Maximum	0.2276	0.4008	59.1	1.2	0.046	0.60

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

• Distance from Roadway: Enter the distance in feet from the nearest edge of the roadway to the project site. The calculator estimates values for distances greater than 10 feet and less than 1000 feet. For distances greater than 1000 feet, the user can choose to extrapolate values using a distribution curve or apply 1000 feet values for greater distances.

• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Sonoma	
Roadway Direction	North-South	
Side of the Roadway	West	
Distance from Roadway	200	feet
Annual Average Daily Traffic (ADT)	14,100	

Results

Sonoma County

NORTH-SOUTH DIRECTIONAL ROADWAY

PM2.5 annual average

0.060 ($\mu g/m^3$)

Cancer Risk

2.30 (per million)

Farmer Lane Extension

Data for Sonoma County based on meteorological data collected from Santa Rosa in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

1.58

(per million)

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

• Distance from Roadway: Enter the distance in feet from the nearest edge of the roadway to the project site. The calculator estimates values for distances greater than 10 feet and less than 1000 feet. For distances greater than 1000 feet, the user can choose to extrapolate values using a distribution curve or apply 1000 feet values for greater distances.

• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Sonoma	
Roadway Direction	North-South	
Side of the Roadway	West	
Distance from Roadway	330	feet
Annual Average Daily Traffic (ADT)	14,100	

Results

Sonoma County

NORTH-SOUTH DIRECTIONAL ROADWAY

PM2.5 annual average

0.034 ($\mu g/m^3$)

Cancer Risk

1.32 (per million)

Farmer Lane Extension

Data for Sonoma County based on meteorological data collected from Santa Rosa in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

0.91

(per million)

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.

ATTACHMENT I

PRELIMINARY STANDARD URBAN STORMWATER MITIGATION PLAN

For The Penstemon Place Project

Carlile • Macy

December 1, 2016

Preliminary Standard Urban Storm Water Mitigation Plan

December 1, 2016

Penstemon Place

APN 044-200-027, 04-200-029, 044-200-040
2574, 2842, 2862 Linwood Avenue
Santa Rosa, CA

Project #: 2015013.00

Carlile · Macy

15 Third Street, Santa Rosa, CA 95401
Tel: 707 542 6451 Fax: 707 542 5212

CIVIL ENGINEERS ▪ URBAN PLANNERS ▪ LAND SURVEYORS ▪ LANDSCAPE ARCHITECTS

TABLE OF CONTENTS

Sections of Standard Urban Storm Water Mitigation Plan (SUSMP) Report:

- Project Description
  - Proposed Development
  - Pollution Prevention Measures
  - Types of BMPs
  - Level of Treatment and Volume Capture
- Pre-developed Conditions
  - Topography
  - Water Bodies Receiving Storm Water
- Design Storm
- Long Term Maintenance

Attachments

- Determination Worksheet
- BMP Selection Tables
- SUSMP Sizing Calculations
  - C-Value and Curve Numbers for Drainage Areas Worksheet
  - Storm Water Calculator and Treatment Capacity for Drainage Areas
- BMP Details
- BMP Inspection and Maintenance Checklists

In Pocket

- Proposed Improvements, Drainage Areas, and BMP Exhibit

PROJECT DESCRIPTION

Project Name: Penstemon Place

Assessor's Parcel Number: 044-200-027, 044-200-029, 044-200-040

Total Area of Site: 9.73 acres

Proposed Development:
The Penstemon Place project site is on 9.73 acres, located in the City of Santa Rosa. The proposed site is bordered by Linwood Avenue to the west and south and Future Farmer's Lane Extension to the east. The proposed development will consist of 60 residential lots with access streets and sidewalks. The runoff produced by the streets, sidewalks and rooftops will be directed into designated roadside bioretention areas.

This project triggers the requirements to implement permanent storm water quality treatment and volume capture BMP features and submit this SUSMP report by creating over 10,000 ft^2 of new impervious surface, creating a combined total of 1 acre or more of impervious surface, and by developing 4 or more new homes. The drainage of the project is divided into tributary areas as shown on the attached SUSMP Exhibits. The areas are designated based on the proposed grading and stormdrain system. There will be no new outfalls built as part of this project since the proposed runoff will be directed into the existing stormdrain systems at three connections points. The first is located under Verbena Drive north of the site, the second is located under Linwood Avenue northwest, and the third is located under Linwood Avenue southwest of the site.

Pollution Prevention Measures:
Runoff from rooftops will be disconnected from stormdrain inlets and directed across landscaped areas. Over 200 new interceptor trees will be planted along Linwood Avenue, proposed streets, and within individual lots. The total tributary area used for treatment and volume capture calculations have been reduced by these measures.

Types of BMPs:
Storm water generated by the project will be treated by detention and infiltration basins installed per detail P2-02 "Priority 2 Roadside Bioretention – Flush Design" and P2-06 "Priority 2 – Permeable Pavement". The colored areas shown in the attached SUSMP exhibits are used to depict the general drainage layout and treatment BMP for the entire project area. The runoff from the areas will be collected and treated in one of two ways. One, lots with no rear yard drain will drain towards the street and will be directed via the gutter to Roadside Bioretention basins. Second, lots with rear yard stormdrains will have the runoff collected in the backyard stormdrain system and conveyed to roadside bioretention basins by use of an exfiltration pipe. Runoff from lots 35-37 will be conveyed to the permeable pavement.

Level of Treatment and Volume Capture:
The project will achieve the requirement of 100% treatment and delta volume capture by use of the biofiltration roadside bioretention basins and permeable pavement.

PRE-DEVELOPED CONDITIONS

Topography:
The existing site consists of 6 single family homes while the remaining site is undeveloped. The site is relatively steep along the eastern border of the site where future Farmer's Lane will be built. The majority of the site drains to the northwest corner. The existing soil type is mostly made up of Ranor Clay which is soil drainage class C and small portion is made up of Clear Lake Clay which is soil drainage class D.

***Water Bodies Receiving Storm Water*:**
In order of reception:

Verbena Drive stormdrain north of site: Public stormdrain system, Old Colgan Creek, Colgan Creek, Laguna de Santa Rosa, Mark West Creek, Russian River.

Linwood Avenue stormdrain northwest of site: Public stormdrain system, Old Colgan Creek, Colgan Creek, Laguna de Santa Rosa, Mark West Creek, Russian River.

Linwood Avenue stormdrain southwest of site: Public stormdrain system, Old Colgan Creek, Colgan Creek, Laguna de Santa Rosa, Mark West Creek, Russian River.

DESIGN STORM

The retention and treatment BMPs are sized based on the rainfall intensity or volume of runoff produced during the 85th percentile mean annual 24-hour storm event as recommended by the LID Manual and the project location's average yearly rainfall of 35 inches.

ASSIGNING LONG TERM MAINTENANCE OF BMPS

The funding and responsibility for the long-term BMP inspection, maintenance, and periodic replacement of the roadside bioretention basins, as described in the Inspection and Maintenance Checklists provided by the Storm Water LID Technical Design Manual and attached herein, will be provided by the property owner.

DETERMINATION WORKSHEET

FOR OFFICE USE ONLY:
Does Project require permanent storm water BMP's?

Y ◯ N ◯

Review Fee Paid?

Y ◯ N ◯

Print Form

City of Santa Rosa

DETERMINATION WORKSHEET

PURPOSE: Use this form to determine whether or not this project will need to incorporate permanent Storm Water Best Management Practices (BMP's) and submit a Standard Urban Storm Water Mitigation Plan (SUSMP).
APPLICABILITY: Requred with all entitilement application packages, improvement plans and building permit applications. Information presented on this worksheet must reflect the final development condition.

Part 1: Information

Penstemon Place	McIntosh Development, LLC.
Project Name	*Applicant Name
2574, 2842, 2862 Linwood Ave.	2880 Cleveland Ave. Suite B
Site Address	Mailing Address
Santa Rosa	Santa Rosa, CA 95403
City/Zip	City/State/Zip
	(707)544-7194
Permit Number(s) - if applicable	Phone/Email/Fax
Carlile Macy	15 Third Street
Engineer Name	Mailing Address
Santa Rosa CA 95401	(707) 542-6451
City/State/Zip	Phone/Email

Type of Application/Project:

- ☒ Subdivision
- ☐ Grading Permit
- ☐ Building Permit
- ☐ Design Review
- ☐ Use Permit
- ☐ Other

*Applicant is the owner or developer.

Part 2: Other Regulatory Determinations

CALGREEN:

1. Does this Project require a non-residential building permit for a newly constructed building without sleeping accomodations? [1]

☐ **YES:** This project may need to implement permanent Storm Water BMP's and be designed in accordance with the Storm Water Low Impact Development (LID) Technical Design Manual due to CALGreen requirements. Complete the remainder of this worksheet.

☒ **NO:** Complete the reminder of this worksheet.

Section 401:

2. Does this Project require a section 401 permit? [2]

☐ Yes ☒ No

2A. if YES, are any of the following a component of this project? (Check all that apply)

☐ Disturbance of 1 acre or more of soil

☐ New Outfall

☐ Any new impervious surface

If you checked any of the boxes in section 2A, please be advised that this Project will require North Coast Regional Water Quality Control Board review and permanent Storm Water BMP's designed in accordance with the Low Impact Development (LID) Technical Design Manual. Skip to page six and sign the "acknowledgement signature section."

Initial Determination:

3. Does this Project create or replace 10,000 sq ft or more of impervious surface?

☒ **YES:** Complete the remainder of this worksheet.

☐ **NO:** This Project does not need to incorporate permanent Storm Water BMPs. Please go to page 6 and complete the exemption signature section.

1. Additions, alterations, repairs and existing structures are not subject to the requirements of CALGreen. For further information on determining building permit requirements, contact the govering agency's building department.
2. A 401 permit is required from the North Coast Regional Water Quality Control Board (NCRWQCB) if any part of this project is located within or adjacent to "waters of the State" which can be a creek, drainage ditch, wetland or any seasonal waterway.For further information on determining 401 Permit requirements, contact the North Coast Regional Water Quality Control Board.

PART 3: Exemptions

1. Is this a ***routine maintenance activity*** [3] that is being conducted to maintain original line and grade, hydraulic capacity, and original purpose of facility such as resurfacing existing roads and parking lots?
Yes ☐ No ☒

2. Is this an ***emergency redevelopment activity***[4] required to protect public health and safety?
Yes ☐ No ☒

3. Is this a project undertaken solely to install or reinstall ***public utilities*** (such as sewer or water lines) that does not include any additional street or road development or development activities?
Yes ☐ No ☒

4. Is this a ***reconstruction project***[5], undertaken by a ***public agency***, of street or roads remaining within the original footprint and less than 48 feet wide?
Yes ☐ N o ☒

5. Is this a stand alone pedestrian pathway, trail or off street bike lane?
Yes ☐ No ☒

Did you answer "YES" to any of the above questions in Part 3?

☐ **YES: Stop.** This project is exempt and will not need to incorporate permanent storm water Best Management Practices. **Please go to Page 6 and complete the exemption signature section.**

☒ **NO:** Proceed to Part 4 below to see if this project will need to incorporate permanent Storm Water BMP's.

Part 4: Project Triggers

Projects that Trigger Requirements:
Please answer the following questions to determine whether this project requires permanent Storm Water BMP's and the submittal of a SUSMP.

1. Does this ***development or redevelopment project*** create or replace a combined total of 1.0 acres or more of impervious surface[6]? Yes ☒ No ☐

3"***Routine Maintenance Activity***"**-** This exemption includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities.

4 "***Emergency Redevelopment"-*** The Regional Water Quality Control Board must agree that the activities are needed to protect public health and safety to qualify for this exemption.

5"***Reconstruction***" is defined as work that replaces surfaces down to subgrade. Street width is measured from face-of-curb to face-of-curb. Overlays, resurfacing, trenching, and patching are considered maintenance activities and are exempt.

6 "***Impervious Surface***" is defined as an area that has been modified to reduce storm water runoff capture and percolation into underlying soils. Such surfaces include rooftops, walkways, and parking areas. Permeable pavementsshall be considered impervious for this section if they have subdrains to preclude infiltration into underlying soils.

2. Does this project create or replace a combined total or 10,000 ft² or more of ***impervious street, roads, highways, or freeway construction or reconstruction?*** Yes ☒ No ☐

3. Does this project include ***four or more new homes***? Yes ☒ No ☐

4. Is this project an ***industrial park***[7] creating or replacing a combined total of 10,000 ft² or more of impervious surface[6]? Yes ☐ No ☒

5. Is this project a ***Commercial strip mall*** [8] creating or replacing a combined total of 10,000 ft² or more of impervious surface[6]? Yes ☐ No ☒

6. Is this project a **retail gasoline outlet** creating or replacing a combined total of 10,000 ft² of more or impervious surface[6]? Yes ☐ No ☒

7. Is this project a **restaurant** creating or replacing a combined total of 10,000 ft² or more of impervious surface[6]? Yes ☐ No ☒

8. Is this project a **parking lot** (not included as part of a project type listed above) creating or replacing a combined total of 10,000 ft² or more or impervious surface or with 25 or more parking spaces? Yes ☐ No ☒

9. Is this project an **automotive service facility** creating or replacing a combined total of 10,000 ft² or more or impervious surface[6]? Yes ☐ No ☒

Did you answer "YES" to any of the above questions in Part 4?

☒ **YES**: The project must implement permanent Storm Water BMP's and be designed in accordance with the Storm Water LID Technical Design Manual. Please complete the remainder of this worksheet. sign under the "Acknowledgment Section" on page 6.

☐ **NO: Stop**. The project will **not** need to incorporate permanent Storm Water BMP's. Please continue to Page 6 and complete the exemption signature section.

---

7 "***Industrial Park***" is defined as industrial facility or building and associated impervious surface on a site zoned or planned to allow industrial or commercial development (planning for mixed-use residential, industrial or commercial development and redevelopment is included).

8 "***Commercial Strip Mall***" is defined as commercial facility or impervious surface on a site zoned or planned to allow commercial or industrial use (planning for mixed-use residential, industrial or commercial development and redevelopment is included) with street access and onsite parking.

Part 5: Project Description

1. Total Project area: [ ] Square feet or [9.73] acres.

2. Existing land use(s): (check all that apply)

☐ Commercial ☐ Industrial ☐ Residential ☐ Public Other [Undeveloped]

Description of buildings, significant site features , etc.:

The existing site consists of 6 single family homes and the remaining area is undeveloped.

3. Existing impervious surface area: [ ] square feet or [0.5] acres.

4. Proposed Land Use (s): (check all that apply)

☐ Commercial ☐ Industrial ☒ Residential ☐ Public Other [ ]

Description of buildings, significant site features, etc.:

The proposed development will consist of 59 residential lots with access streets and sidewalks.

Acknowledgment Signature Section:

As the property owner or developer, I understand that this project is required to implement permanent Storm Water Best Management Practices and the submittal of a SUSMP. Any unknown responses must be resolved to determine if the project is subject to these requirements.

_____ _____

Signature of Property Owner or Developer Date

Exemption Signature Section:

As the property owner or developer, I understand that this project as currently designed does not require permanent Storm Water BMP's nor the submital of a SUSMP. I understand that redesign may require submittal of a new Determination Worksheet and may require permananet Storm Water BMP's .

_____ _____

Signature of Property Owner or Developer Date

Implementation Requirements: *All calculations shall be completed using the "Storm Water Calculator" available at: www.srcity.org/stormwaterLID*

Design Goal: Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual. 100% volume capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 2 and 3 of this calculator do not need to be completed. This is a retention requirement.

Design Requirements: If the Design Goal of 100% volume capture is not achieved; then both Requirement 1-100% Treatment AND Requirement 2- Volume Capture must be achieved.

***Requirement 1*:** Treatment of 100% of the flow generated by the 85th percentile 24 hour storm event, as calculated using the Rational Method and a know intensity of 0.20 inches per hour.

Requirement 2: Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by the 85th percentile 24 hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual. This is a retention requirement.

BMP SELECTION TABLES

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in priority selected?	Yes	No	Explanation of selection	Other notes:
Universal LID Features- to be considered on all projects.	Living Roof	N/A	N/A		x	x	x		x	x				X		
	Rainwater Harvesting	N/A	N/A		x	x	x			x				X		
	Interceptor Trees	N/A	N/A		x	x	x				x		X			
	Vegetated Buffer Strip	UN-01	Vegetated Buffer Strip								x			X		
	Bovine Terrace	UN-02	Bovine Terrace		x						x			X		
	Impervious Area Disconnection	N/A	N/A		x	x	x				x		X			

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 1 and 1A BMPs- to be installed with no underdrains or liners. Must drain all stading water within 72 hours.	Rain Garden	P1-01	Rain Garden						x	x				X		
	Roadside Bioretention	P1-02	Roadside Bioretention - no C & G						x	x				X		
	Vegetated Swale-with Bioretention	P1-06	Swale with Bioretention						x	x				X		
	Constructed Wetlands	N/A	N/A						x	x				X		
	Infiltration Trench	P1-07	Infiltration Trench						x	x				X		

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 2 BMPs- with subsurface drains installed above the capture volume.	Rain Garden	P2-01	Rain Garden						x	x				X		
	Roadside Bioretention	P2-02	Roadside Bioretinton - Flush Design Roadside						x	x			X			
		P2-03	Roadside Bioretenion- Contiguous SW						x	x				X		
		P2-04	Roadside Bioretenion- Curb Opening						x	x				X		
		P2-05	Roadside Bioretenion- No C & G						x	x				X		
	Pervious Pavement	P2-06	Vegetated Buffer Strip						x	x			X			
	Constructed Wetlands	N/A	N/A						x	x				X		

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 3 BMPs- installed with subdrains and/or impermeable liner. Does not achieve volume capture and must be used as part of a treatment train.	Rain Garden	P3-01	Rain Garden		x	x	x		x					X		
	Bioretention	P3-02	Roadside Bioretinton - Flush Design Roadside		x	x	x		x					X		
		P3-03	Roadside Bioretenion- Contiguous SW		x	x	x		x					X		
		P3-04	Roadside Bioretenion- Curb Opening		x	x	x		x					X		
		P3-05	Roadside Bioretenion- No C & G		x	x	x		x	x				X		
	Flow Through Planters													X		
	Pervious Pavement	P1-04	Vegetated Buffer Strip		x	x	x		x	x				X		
	Vegetated Swale	P3-07	Vegetated Swale		x	x	x		x	x				X		

BMP Selection Table

	Best Management Practice (BMP)	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 4 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Tree Filter Unit		x	x	x		x					x		
	Modular Bioretention		x	x	x		x					x		
Priority 5 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Chambered Separator Units		x	x	x		x					x		
	Centrifugal Separator Units		x	x	x		x					x		
	Trash Excluders		x	x	x		x					x		
	Filter Inserts		x	x	x		x					x		
Priority 6 BMPs-	Offset Program						N/A	N/A	N/A			x		
Other	Detention		x											

DRAINAGE AREA C-VALUE AND CURVE NUMBER CALCULATIONS

Penstemon Place

2574, 2842, 2862, Linwood Ave.

APN - 044-200-027, 044-200-029, 044-200-040

Prepared by Carlile Macy

November 15, 2016

C-Values and Curve Numbers for Preliminary Drainage Areas

Surface Type	Asphalt	Concrete	Rooftop	Landscape
C-Value	0.70	0.80	0.90	0.35
Curve Number	98	98	98	80

K =	1.17	
P =	0.92	in
Intensity =	0.2	in/hr
Average Rainfall =	35	in

Proposed

Drainage Area	Treatment Type	Surface Type: Asphalt ft^2	Concrete ft^2	Rooftop ft^2	Landscape ft^2	Total Area ft^2	Total Area acres	C-Value	Curve Number
Area 1	Bioretention	8,300	12,857	17,294	22,633	61,084	1.40	0.65	91.3
Area 2	Bioretention	4,156	5,403	9,916	14,566	34,041	0.78	0.62	90.3
Area 3	Bioretention	4,975	3,532	8,389	9,086	25,982	0.60	0.66	91.7
Area 4	Bioretention	4,380	2,046	3,745	5,613	15,783	0.36	0.64	91.6
Area 5	Bioretention	13,535	5,840	9,402	18,499	47,276	1.09	0.62	91.0
Area 6	Bioretention	5,266	3,090	7,904	12,091	28,350	0.65	0.62	90.3
Area 7	Bioretention	6,659	3,606	6,714	25,923	42,903	0.98	0.53	87.1
Area 8	Permeable Pavement		3,118	6,198	16,193	25,509	0.59	0.54	86.6
Area 9	Bioretention	7,936	5,022	13,342	30,314	56,614	1.30	0.57	88.4
Area 10	Bioretention	12,059	6,002	11,635	23,601	53,297	1.22	0.60	90.0
Area 11	Bioretention	11,133	6,489	14,496	21,030	53,148	1.22	0.63	90.9
Area 12	Bioretention	2,015	535	985	3,211	6,746	0.15	0.57	89.4
Overall		80,413	57,539	110,021	202,759	450,732	10.35	0.60	89.9

Penstemon Place

2574, 2842, 2862, Linwood Ave.

APN - 044-200-027, 044-200-029, 044-200-040

Prepared by Carlile Macy

November 15, 2016

C-Values and Curve Numbers for Preliminary Drainage Areas

Surface Type	Asphalt	Gravel Driveway	Misc. Concrete	Rooftop	Open Space
C-Value	0.70	0.60	0.80	0.90	0.35
Curve Number	98	84	98	98	80

Existing

Drainage Area	Surface Type: Asphalt ft^2	Gravel Driveway ft^2	Misc. Concrete ft^2	Rooftop ft^2	Open Space ft^2	Total Area ft^2	Total Area acres	C-Value	Curve Number
Area 1	5,592		2,044	4,210	49,237	61,084	1.40	0.44	83.5
Area 2					34,041	34,041	0.78	0.35	80.0
Area 3			430		25,552	25,982	0.60	0.36	80.3
Area 4	78		435	668	14,601	15,783	0.36	0.39	81.3
Area 5			460		46,816	47,276	1.09	0.35	80.2
Area 6			455		27,895	28,350	0.65	0.36	80.3
Area 7			446		42,456	42,903	0.98	0.35	80.2
Area 8					25,509	25,509	0.59	0.35	80.0
Area 9	76		136	2,157	54,246	56,614	1.30	0.37	80.8
Area 10	158		551	2,170	50,418	53,297	1.22	0.38	81.0
Area 11	8,446		1,122	4,817	38,763	53,148	1.22	0.46	84.9
Area 12	873		1,092	1,400	3,381	6,746	0.15	0.58	89.0
Overall	15,224	0	7,172	15,421	412,915	450,732	10.35	0.39	81.5

DRAINAGE AREA CALCULATIONS

Penstemon Place

2574, 2842, 2862, Linwood Ave.

APN - 044-200-027, 044-200-029, 044-200-040

Prepared by Carlile Macy

November 15, 2016

Interceptor Trees

Drainage Area	Proposed Coniferous Trees	Proposed Deciduous Trees	Existing Canopy
Area 1	0	45	2,872
Area 2	0	17	0
Area 3	0	15	
Area 4	0	11	
Area 5	0	30	
Area 6	0	14	
Area 7	0	18	5,706
Area 8		5	
Area 9	0	22	
Area 10	0	27	3,606
Area 11	0	24	4,007
Area 12	0	5	
Overall	0	233	16,191

Penstemon Place

2574, 2842, 2862, Linwood Ave.

APN - 044-200-027, 044-200-029, 044-200-040

Prepared by Carlile Macy

November 15, 2016

Bioretention Treatment Summary

Drainage Area	Treatment Type	Width (W)	Length (L) ft	Biosoil Depth (D_s) ft	V_{Goal} ft^3	V_{Delta} ft^3	$Q_{Treatment}$ cfs	$V_{Available}$ ft^3	% V_{Goal}	% V_{Delta}
Area 1	Bioretention	13.5	106	3	1,704	1,017	0.165	1717	101%	169%
Area 2	Bioretention	13.5	56	3	894	638	0.093	907	101%	142%
Area 3	Bioretention	13.5	48	3	765	873	0.073	778	102%	136%
Area 4	Bioretention	13.5	30	3	476	335	0.045	486	102%	145%
Area 5	Bioretention	13.5	86	3	1,378	1,007	0.133	1393	101%	138%
Area 6	Bioretention	13.5	47	3	750	529	0.078	761	101%	144%
Area 7	Bioretention	13.5	50	3	791	465	0.100	810	102%	174%
Area 8	Pavers	18	22	3	470	260	0.064	476	101%	183%
Area 9	Bioretention	13.5	78	3	1,260	772	0.148	1264	100%	164%
Area 10	Bioretention	13.5	84	3	1,349	897	0.140	1361	101%	152%
Area 11	Bioretention	13.5	90	3	1,440	710	0.143	1460	101%	205%
Area 12	Bioretention	13.5	11	3	168	7	0.018	179	106%	2497%

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 1 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **61,084** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **17,294** ft^2

Rooftop Area Factor = **0.28** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(61,084 x 0.45 x 0.28) = **7782.30** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(61,084 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 45 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 4,500 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 2,872 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 1,436 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 5,936 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 61,084 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 13,718.30 ft^2

Reduced Tributary Area to be used for Calculations = 47,366 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 47,366 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = D: 0 - 0.05 in/hr infiltration (transmission) rate
Select post development ground cover description [5] = Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)

CN_{POST} = 89
OR: Composite post development CN [9] = 91

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 0.94092 in

$$S_{POST} = \frac{1000}{91} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03597 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 0.94)]^2}{[(0.92 * 1.17)+(0.8 * 0.94)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 1703.76 ft^3

$$V_{GOAL} = (0.03597)(47,366)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:

The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.

The table of values can be found here.

This smaller value should not be used to size the overflow bypass.

Input:

A_r =	47,366	ft^2 =	1.09	Acres
C_{POST} [10] =	0.65			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.16539 cfs

$Q_{TREATMENT}$= (0.2)(1.09)(0.65)(1.17)

NOTE:

The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:

If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92 — *0.92 inches in the Santa Rosa area, based on local historical data.*
K= Seasonal Precipitation Factor [7]

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	47,366	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	D: 0 - 0.05 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Row Crops - Contoured & terraced + Crop residue cover - Good
Select post development ground cover description [5] =	Woods (50%), grass (50%) combination (orchard or tree farm) - Poor
CN_{PRE} =	80
CN_{POST} =	86
OR Composite Predevelopment CN [9] =	84
Composite Post development CN [9] =	91

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 1.98 in

$S_{PRE} = \frac{1000}{84} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01450 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*1.98)]^2}{[(0.92*1.17)+(0.8*1.98)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 686.80 ft^3

V_{PRE}= (0.01450)(47,366)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 0.94092 in

$S_{POST} = \frac{1000}{91} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03597 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*0.94)]^2}{[(0.92*1.17)+(0.8*0.94)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 1703.74 ft^3

V_{POST}= (0.03597)(47,366)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (1,703.74) - (686.80)

V_{DELTA}= 1016.94 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **4259.39** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **1431.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **1,704** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	106.0	ft	

Solution:

Percent of Goal Achieved = **100.79** **%** = [(3.0 x 1,431) / 4,259] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **2542.35** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **1431.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **1016.94** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	106.0	ft	

Solution:

Percent of Requirement Achieved = **168.86** **%** = [(3.0 x 1,431) / 2,542] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 2 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **34,041** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **9,916** ft^2

Rooftop Area Factor = **0.29** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(34,041 x 0.45 x 0.29) = **4462.20** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(34,041 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= 0 **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 22 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 2,200 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 2,200 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 34,041 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 6,662.20 ft^2

Reduced Tributary Area to be used for Calculations = 27,379 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 27,379 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**
Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} = 79
OR: Composite post development CN [9] = 90

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.07 in

$$S_{POST} = \frac{1000}{90} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03207 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.07)]^2}{[(0.92 * 1.17)+(0.8 * 1.07)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 878.04 ft^3

$$V_{GOAL} = (0.03207)(27,379)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	27,379	ft^2 =	0.62853	Acres
C_{POST} [10] =	0.62			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.09119 cfs

$Q_{TREATMENT}$= (0.2)(0.6285)(0.62)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92 *0.92 inches in the Santa Rosa area, based on local historical data.*
K= Seasonal Precipitation Factor [7]

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	27,379	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	90

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.48 in

$S_{PRE} = \frac{1000}{80} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00917 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.48)]^2}{[(0.92*1.17)+(0.8*2.48)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 251.06 ft^3

V_{PRE}= (0.00917)(27,379)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.07 in

$S_{POST} = \frac{1000}{90} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03207 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.07)]^2}{[(0.92*1.17)+(0.8*1.07)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 878.04 ft^3

V_{POST}= (0.03207)(27,379)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (878.04) - (251.06)

V_{DELTA}= 626.97 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **2195.11** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **742.50** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **878** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	55.0	ft	

Solution:

Percent of Goal Achieved = **101.48** **%** = [(3.0 x 743) / 2,195] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1567.44** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **742.50** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **626.97** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	55.0	ft	

Solution:

Percent of Requirement Achieved = **142.11** **%** = [(3.0 x 743) / 1,567] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 3 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **25,982** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **8,389** ft^2

Rooftop Area Factor = **0.32** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(25,982 x 0.45 x 0.32) = **3775.05** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(25,982 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= 0 **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 15 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 1,500 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 1,500 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area =	25,982	ft^2
Tributary Area Reduction due to Pollution Prevention Measures [4] =	5,275.05	ft^2
Reduced Tributary Area to be used for Calculations =	20,707	ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	20,707	ft^2
K [7] =	1.17	

Drop down Lists

Select post development hydrologic soil type within tributary area [8] =	B: 0.15 - 0.30 in/hr infiltration (transmission) rate
Select post development ground cover description [5] =	Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)

CN_{POST} =	79	
OR: Composite post development CN [9] =	92	

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 0.90513 in

$$S_{POST} = \frac{1000}{92} - 10$$

Q_{POST}= 0.03694 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 0.91)]^2}{[(0.92 * 1.17)+(0.8 * 0.91)]} \times \frac{1ft}{12in}$$

V_{GOAL}= 764.92 ft^3

$$V_{GOAL} = (0.03694)(20,707)$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).
Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*
V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	20,707	ft^2 =	0.47537	Acres
C_{POST} [10] =	0.66			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.07342 cfs

$Q_{TREATMENT}$= (0.2)(0.4754)(0.66)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	20,707	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	92

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.47 in

$$S_{PRE} = \frac{1000}{80} - 10$$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00926 ft

$$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.47)]^2}{[(0.92*1.17)+(0.8*2.47)]} \times \frac{1ft}{12in}$$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 191.75 ft^3

V_{PRE}= (0.00926)(20,707)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 0.90513 in

$$S_{POST} = \frac{1000}{92} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03694 ft

$$Q_{POST} = \frac{[(0.92*1.17)-(0.2*0.91)]^2}{[(0.92*1.17)+(0.8*0.91)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 764.91 ft^3

V_{POST}= (0.03694)(20,707)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= (V_{POST}-V_{PRE})

Delta Volume Capture= (764.91) - (191.75)

V_{DELTA}= 573.17 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **1912.29** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **648.00** ft^2

Where:
$V_{LID\ GOAL}$= Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **765** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	48.0	ft	

Solution:

Percent of Goal Achieved = **101.66** **%** = [(3.0 x 648) / 1,912] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1432.92** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **648.00** ft^2

Where:
$V_{LID\ DELTA}$= Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **573.17** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	48.0	ft	

Solution:

Percent of Requirement Achieved = **135.67** **%** = [(3.0 x 648) / 1,433] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 4 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **15,783** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **3,745** ft^2

Rooftop Area Factor = **0.24** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(15,783 x 0.45 x 0.24) = **1685.25** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(15,783 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= 0 **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 11 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 1,100 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 1,100 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 15,783 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 2,785.25 ft^2

Reduced Tributary Area to be used for Calculations = 12,998 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 12,998 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**
Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} = 79
OR: Composite post development CN [9] = 92

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 0.91703 in

$$S_{POST} = \frac{1000}{92} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03662 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 0.92)]^2}{[(0.92 * 1.17)+(0.8 * 0.92)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 475.99 ft^3

$$V_{GOAL} = (0.03662)(12,998)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	12,998	ft^2 =	0.29839	Acres
C_{POST} [10] =	0.64			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.04469 cfs

$Q_{TREATMENT}$= (0.2)(0.2984)(0.64)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	12,998	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	81
Composite Post development CN [9] =	92

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.30 in

$$S_{PRE} = \frac{1000}{81} - 10$$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01086 ft

$$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.30)]^2}{[(0.92*1.17)+(0.8*2.30)]} \times \frac{1ft}{12in}$$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 141.16 ft^3

V_{PRE}= (0.01086)(12,998)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 0.91703 in

$$S_{POST} = \frac{1000}{92} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03662 ft

$$Q_{POST} = \frac{[(0.92*1.17)-(0.2*0.92)]^2}{[(0.92*1.17)+(0.8*0.92)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 475.98 ft^3

V_{POST}= (0.03662)(12,998)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= (V_{POST}-V_{PRE})

Delta Volume Capture= (475.98) - (141.16)

V_{DELTA}= 334.82 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **1189.97** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **405.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **476** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	30.0	ft	

Solution:

Percent of Goal Achieved = **102.10** **%** = [(3.0 x 405) / 1,190] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **837.06** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **405.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA} = **334.82** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	30.0	ft	

Solution:

Percent of Requirement Achieved = **145.15** **%** = [(3.0 x 405) / 837] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 5 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **47,276** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **9,402** ft^2

Rooftop Area Factor = **0.20** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(47,276 x 0.45 x 0.20) = **4230.90** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(47,276 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 30 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 3,000 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 3,000 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area =	47,276	ft^2
Tributary Area Reduction due to Pollution Prevention Measures [4] =	7,230.90	ft^2
Reduced Tributary Area to be used for Calculations =	40,045	ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	40,045	ft^2
K [7] =	1.17	

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**

Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} =	79
OR: Composite post development CN [9] =	91

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 0.98901 in

$$S_{POST} = \frac{1000}{91} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03441 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 0.99)]^2}{[(0.92 * 1.17)+(0.8 * 0.99)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 1377.95 ft^3

$$V_{GOAL} = (0.03441)(40,045)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	40,045	ft^2 =	0.91931	Acres
C_{POST} [10] =	0.62			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.13337 cfs

$Q_{TREATMENT}$= (0.2)(0.9193)(0.62)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	40,045	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	91

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.47 in

$S_{PRE} = \frac{1000}{80} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00926 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.47)]^2}{[(0.92*1.17)+(0.8*2.47)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 370.82 ft^3

V_{PRE}= (0.00926)(40,045)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 0.98901 in

$S_{POST} = \frac{1000}{91} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03441 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*0.99)]^2}{[(0.92*1.17)+(0.8*0.99)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 1377.95 ft^3

V_{POST}= (0.03441)(40,045)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (1,377.95) - (370.82)

V_{DELTA}= 1007.13 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **3444.87** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **1161.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **1,378** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	86.0	ft	

Solution:

Percent of Goal Achieved = **101.11** **%** = [(3.0 x 1,161) / 3,445] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **2517.84** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **1161.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **1007.13** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	86.0	ft	

Solution:

Percent of Requirement Achieved = **138.33** **%** = [(3.0 x 1,161) / 2,518] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 6 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **28,350** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **7,904** ft^2

Rooftop Area Factor = **0.28** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(28,350 x 0.45 x 0.28) = **3556.80** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(28,350 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 14 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 1,400 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 1,400 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 28,350 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 4,956.80 ft^2

Reduced Tributary Area to be used for Calculations = 23,393 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12''}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 23,393 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = B: 0.15 - 0.30 in/hr infiltration (transmission) rate
Select post development ground cover description [5] = Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)

CN_{POST} = 79
OR: Composite post development CN [9] = 90

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.07 in

$$S_{POST} = \frac{1000}{90} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03207 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.07)]^2}{[(0.92 * 1.17)+(0.8 * 1.07)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 750.21 ft^3

$$V_{GOAL} = (0.03207)(23,393)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	23,393	ft^2 =	0.53703	Acres
C_{POST} [10] =	0.62			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.07791 cfs

$Q_{TREATMENT}$= (0.2)(0.5370)(0.62)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	23,393	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	90

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.45 in

$S_{PRE} = \frac{1000}{80} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00944 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.45)]^2}{[(0.92*1.17)+(0.8*2.45)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 220.83 ft^3

V_{PRE}= (0.00944)(23,393)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.07 in

$S_{POST} = \frac{1000}{90} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03207 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.07)]^2}{[(0.92*1.17)+(0.8*1.07)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 750.22 ft^3

V_{POST}= (0.03207)(23,393)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (750.22) - (220.83)

V_{DELTA}= 529.39 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **1875.53** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **634.50** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **750** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	47.0	ft	

Solution:

Percent of Goal Achieved = **101.49** **%** = [(3.0 x 635) / 1,876] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1323.47** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **634.50** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **529.39** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	47.0	ft	

Solution:

Percent of Requirement Achieved = **143.83** **%** = [(3.0 x 635) / 1,323] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 7 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **42,903** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **6,714** ft^2

Rooftop Area Factor = **0.16** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(42,903 x 0.45 x 0.16) = **3021.30** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(42,903 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 18 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 1,800 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 5,706 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 2,853 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 4,653 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area =	42,903	ft^2
Tributary Area Reduction due to Pollution Prevention Measures [4] =	7,674.30	ft^2
Reduced Tributary Area to be used for Calculations =	35,229	ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	35,229	ft^2
K [7] =	1.17	

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**

Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} =	79
OR: Composite post development CN [9] =	87

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.48 in

$$S_{POST} = \frac{1000}{87} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02245 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.48)]^2}{[(0.92 * 1.17)+(0.8 * 1.48)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 790.89 ft^3

$$V_{GOAL} = (0.02245)(35,229)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	35,229	ft^2 =	0.80874	Acres
C_{POST} [10] =	0.53			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.10030 cfs

$Q_{TREATMENT}$= (0.2)(0.8087)(0.53)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92 — *0.92 inches in the Santa Rosa area, based on local historical data.*
K= Seasonal Precipitation Factor [7]

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	35,229	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	87

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.47 in

$S_{PRE} = \frac{1000}{80} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00926 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.47)]^2}{[(0.92*1.17)+(0.8*2.47)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 326.22 ft^3

V_{PRE}= (0.00926)(35,229)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.48 in

$S_{POST} = \frac{1000}{87} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02245 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.48)]^2}{[(0.92*1.17)+(0.8*1.48)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 790.88 ft^3

V_{POST}= (0.02245)(35,229)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (790.88) - (326.22)

V_{DELTA}= 464.67 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **1977.23** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **675.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **791** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	50.0	ft	

Solution:

Percent of Goal Achieved = **102.42** **%** = [(3.0 x 675) / 1,977] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1161.67** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **675.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **464.67** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	50.0	ft	

Solution:

Percent of Requirement Achieved = **174.32** **%** = [(3.0 x 675) / 1,162] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 8 - P2-06 Permeable Pavers

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **25,509** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **6,198** ft^2

Rooftop Area Factor = **0.24** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(25,509 x 0.45 x 0.24) = **2789.10** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(25,509 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 5 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 500 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 500 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 25,509 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 3,289.10 ft^2

Reduced Tributary Area to be used for Calculations = 22,220 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 22,220 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = B: 0.15 - 0.30 in/hr infiltration (transmission) rate
Select post development ground cover description [5] = Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)

CN_{POST} = 79
OR: Composite post development CN [9] = 87

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.55 in

$$S_{POST} = \frac{1000}{87} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02113 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.55)]^2}{[(0.92 * 1.17)+(0.8 * 1.55)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 469.51 ft^3

$$V_{GOAL} = (0.02113)(22,220)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	22,220	ft^2 =	0.51010	Acres
C_{POST} [10] =	0.54			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.06446 cfs

$Q_{TREATMENT}$= (0.2)(0.5101)(0.54)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92 — *0.92 inches in the Santa Rosa area, based on local historical data.*
K= Seasonal Precipitation Factor [7]

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	22,220	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	80
Composite Post development CN [9] =	87

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.45 in

$S_{PRE} = \frac{1000}{80} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.00944 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.45)]^2}{[(0.92*1.17)+(0.8*2.45)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 209.76 ft^3

V_{PRE}= (0.00944)(22,220)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.55 in

$S_{POST} = \frac{1000}{87} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02113 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.55)]^2}{[(0.92*1.17)+(0.8*1.55)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 469.51 ft^3

V_{POST}= (0.02113)(22,220)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (469.51) - (209.76)

V_{DELTA}= 259.75 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = 1173.77 ft^3

$A_{LID\ GOAL}=(W)(L)$ = 396.00 ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = 470 ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	18.0	ft	
L =	22.0	ft	

Solution:

Percent of Goal Achieved = 101.21 % = [(3.0 x 396) / 1,174] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = 649.38 ft^3

$A_{LID\ DELTA}=(W)(L)$ = 396.00 ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= 259.75 ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	18.0	ft	
L =	22.0	ft	

Solution:

Percent of Requirement Achieved = 182.94 % = [(3.0 x 396) / 649] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 9 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **56,614** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **13,342** ft^2

Rooftop Area Factor = **0.24** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(56,614 x 0.45 x 0.24) = **6003.90** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(56,614 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 22 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 2,200 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 2,200 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 56,614 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 8,203.90 ft^2

Reduced Tributary Area to be used for Calculations = 48,410 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 48,410 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = D: 0 - 0.05 in/hr infiltration (transmission) rate
Select post development ground cover description [5] = Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)

CN_{POST} = 89
OR: Composite post development CN [9] = 88

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.31 in

$$S_{POST} = \frac{1000}{88} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02602 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.31)]^2}{[(0.92 * 1.17)+(0.8 * 1.31)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 1259.63 ft^3

$$V_{GOAL} = (0.02602)(48,410)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:

The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.

The table of values can be found here.

This smaller value should not be used to size the overflow bypass.

Input:

A_r =	48,410	ft^2 =	1.11	Acres
C_{POST} [10] =	0.57			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.14823 cfs

$Q_{TREATMENT}$= (0.2)(1.11)(0.57)(1.17)

NOTE:

The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:

If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	48,410	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	D: 0 - 0.05 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	84
CN_{POST} =	92
OR Composite Predevelopment CN [9] =	81
Composite Post development CN [9] =	88

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.38 in

$S_{PRE} = \frac{1000}{81} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01008 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.38)]^2}{[(0.92*1.17)+(0.8*2.38)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 487.97 ft^3

V_{PRE}= (0.01008)(48,410)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.31 in

$S_{POST} = \frac{1000}{88} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02602 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.31)]^2}{[(0.92*1.17)+(0.8*1.31)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 1259.63 ft^3

V_{POST}= (0.02602)(48,410)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (1,259.63) - (487.97)

V_{DELTA}= 771.66 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **3149.07** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **1053.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **1,260** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	78.0	ft	

Solution:

Percent of Goal Achieved = **100.32** **%** = [(3.0 x 1,053) / 3,149] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1929.14** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **1053.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **771.66** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	78.0	ft	

Solution:

Percent of Requirement Achieved = **163.75** **%** = [(3.0 x 1,053) / 1,929] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 10 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **53,297** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **11,635** ft^2

Rooftop Area Factor = **0.22** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(53,297 x 0.45 x 0.22) = **5235.75** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(53,297 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 27 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 2,700 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 3,606 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 1,803 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 4,503 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 53,297 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 9,738.75 ft^2

Reduced Tributary Area to be used for Calculations = 43,558 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12''}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 43,558 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**
Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} = 79
OR: Composite post development CN [9] = 90

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.11 in

$$S_{POST} = \frac{1000}{90} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03097 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.11)]^2}{[(0.92 * 1.17)+(0.8 * 1.11)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 1348.99 ft^3

$$V_{GOAL} = (0.03097)(43,558)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	43,558	ft^2 =	0.99996	Acres
C_{POST} [10] =	0.60			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.14039 cfs

$Q_{TREATMENT}$= (0.2)(1.0000)(0.60)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	43,558	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	81
Composite Post development CN [9] =	90

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 2.35 in

$S_{PRE} = \frac{1000}{81} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01037 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*2.35)]^2}{[(0.92*1.17)+(0.8*2.35)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 451.70 ft^3

V_{PRE}= (0.01037)(43,558)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.11 in

$S_{POST} = \frac{1000}{90} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03097 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.11)]^2}{[(0.92*1.17)+(0.8*1.11)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 1349.00 ft^3

V_{POST}= (0.03097)(43,558)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (1,349.00) - (451.70)

V_{DELTA}= 897.30 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:

If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:

If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **3372.48** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **1134.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **1,349** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	84.0	ft	

Solution:

Percent of Goal Achieved = **100.88** **%** = [(3.0 x 1,134) / 3,372] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **2243.25** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **1134.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **897.30** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	84.0	ft	

Solution:

Percent of Requirement Achieved = **151.65** **%** = [(3.0 x 1,134) / 2,243] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 11 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **53,148** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **14,496** ft^2

Rooftop Area Factor = **0.27** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(53,148 x 0.45 x 0.27) = **6523.20** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(53,148 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 24 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 2,400 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = 4,007 **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 2,004 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 4,404 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area =	53,148	ft^2
Tributary Area Reduction due to Pollution Prevention Measures [4] =	10,926.70	ft^2
Reduced Tributary Area to be used for Calculations =	42,221	ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12''}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	42,221	ft^2
K [7] =	1.17	

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**

Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} =	79
OR: Composite post development CN [9] =	91

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.00 in

$$S_{POST} = \frac{1000}{91} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03411 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.00)]^2}{[(0.92 * 1.17)+(0.8 * 1.00)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 1440.16 ft^3

$$V_{GOAL} = (0.03411)(42,221)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:

The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.

The table of values can be found here.

This smaller value should not be used to size the overflow bypass.

Input:

A_r =	42,221	ft^2 =	0.96927	Acres
C_{POST} [10] =	0.63			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.14289 cfs

$Q_{TREATMENT}$= (0.2)(0.9693)(0.63)(1.17)

NOTE:

The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:

If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92 — *0.92 inches in the Santa Rosa area, based on local historical data.*
K= Seasonal Precipitation Factor [7]

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	42,221	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	85
Composite Post development CN [9] =	91

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 1.78 in

$S_{PRE} = \frac{1000}{85} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01730 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*1.78)]^2}{[(0.92*1.17)+(0.8*1.78)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 730.43 ft^3

V_{PRE}= (0.01730)(42,221)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.00 in

$S_{POST} = \frac{1000}{91} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.03411 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.00)]^2}{[(0.92*1.17)+(0.8*1.00)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 1440.17 ft^3

V_{POST}= (0.03411)(42,221)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (1,440.17) - (730.43)

V_{DELTA}= 709.74 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = **3600.40** ft^3

$A_{LID\ GOAL}=(W)(L)$ = **1215.00** ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = **1,440** ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	90.0	ft	

Solution:

Percent of Goal Achieved = **101.24** **%** = [(3.0 x 1,215) / 3,600] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = **1774.35** ft^3

$A_{LID\ DELTA}=(W)(L)$ = **1215.00** ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= **709.74** ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	90.0	ft	

Solution:

Percent of Requirement Achieved = **205.43** **%** = [(3.0 x 1,215) / 1,774] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

STORM WATER CALCULATOR*

***Go to www.srcity.org/stormwaterlid for the latest version of the calculator**

Project:	Penstemon Place
Address/Location:	Santa Rosa
Designer:	Carlile Macy
Date:	November 15, 2016
Inlet Number/Tributary Area/BMP:	Area 12 - P2-02 Bioretention Flush Design

NOTE: In order for this calculator to function properly **macros must be enabled**.

Physical Tributary Area that drains to Inlet/BMP = **6,746** ft^2

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

Disconnected Roof Drains [1]

Input:

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10'to 14'**

Condition Factor = **0.45**

Method 1: **Based on the total rooftop drainage area** - to be used if rooftop information is known.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = **985** ft^2

Rooftop Area Factor = **0.15** Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(6,746 x 0.45 x 0.15) = **443.25** ft^2 **Rooftop Drainage Area Reduction**

Method 2: **Based on density (units per acre)** - to be used if rooftop information is unknown.

Input:

Enter percent of rooftop area to be disconnected from downspouts: **0** %

Select Density: **3-4** Units per Acre

Density Reduction Factor= **0.19**

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(6,746 x 0.45 x 0.00 x 0.19) = **0.00** ft^2 **Density Reduction**

NOTE:
Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] *Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.*

[5] *Per the "Urban Hydrology For Small Watersheds" TR-55 manual.*

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

[8] *Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Not Directly-connected Paved Area

Multiplier = 1

Enter area of alternatively designed paved area: 0 ft^2

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

Interceptor Trees [2]

Number of new ***Evergreen Trees*** that qualify as interceptor trees= **New Evergreen Trees**

Area Reduction due to new Evergreen Trees= 0 ft^2 (200 ft^2/tree)

NOTE:
Total Interceptor Area Reduction is limited to 50% of the physical tributary area.

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 5 **New Deciduous Trees**

Area Reduction due to new Deciduous Trees= 500 ft^2 (100 ft^2/tree)

Enter square footage of qualifying **existing tree canopy** = **Existing Tree Canopy**

Allowed reduction credit for existing tree canopy= 0 ft^2 Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction = 500 ft^2 = Sum of areas managed by evergreen + deciduous + existing canopy

INSTRUCTIONS:
Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

Buffer Strips & Bovine Terraces [3]

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft^2

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft^2

INSTRUCTIONS:
Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

Revised Tributary Area due to Pollution Prevention Measures

Physical Tributary Area = 6,746 ft^2

Tributary Area Reduction due to Pollution Prevention Measures [4] = 943.25 ft^2

Reduced Tributary Area to be used for Calculations = 5,803 ft^2

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

Design Goal: 100% Volume Capture

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12''}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **0.92**
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$$V = (Q)(A_r)$$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r = 5,803 ft^2
K [7] = 1.17

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = **B: 0.15 - 0.30 in/hr infiltration (transmission) rate**
Select post development ground cover description [5] = **Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)**

CN_{POST} = 79
OR: Composite post development CN [9] = 89

NOTE:
Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.19 in

$$S_{POST} = \frac{1000}{89} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02888 ft

$$Q_{POST} = \frac{[(0.92 * 1.17)-(0.2 * 1.19)]^2}{[(0.92 * 1.17)+(0.8 * 1.19)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{GOAL}= 167.59 ft^3

$$V_{GOAL} = (0.02888)(5,803)$$

V_{GOAL}= Post Development Volume of Storm Water to be Retained (ft^3)

INSTRUCTIONS:
This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Requirement 1: 100% Treatment

Treatment of 100% of the flow generated by 85th percentile 24 hour mean annual rain event (0.2 in/hr).

Formula:

$Q_{TREATMENT}$= (0.2 in/hr)(A_r)(C_{POST})(K) cfs

Where:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
C_{POST} = Rational method runoff coefficient for the developed condition [10]
A_r = Reduced Tributary Area including credit for Pollution Prevention Measures (in Acres)
K = Seasonal Precipitation Factor [7]

C value note:
The C value used for this calculation is smaller than the value used for hydraulic Flood Control design.
The table of values can be found here.
This smaller value should not be used to size the overflow bypass.

Input:

A_r =	5,803	ft^2 =	0.13321	Acres
C_{POST} [10] =	0.57			
K [7] =	1.2			

Solution:

$Q_{TREATMENT}$= 0.01777 cfs

$Q_{TREATMENT}$= (0.2)(0.1332)(0.57)(1.17)

NOTE:
The Flow Rate calculated here should only be used to size the appropriate BMP. All associated overflow inlets and systems should be sized for the Flood Control event.

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, this page of the calculator, AND Requirement 2- Volume Capture, page 5 of the calculator, **must** be achieved.

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

Formulas:

$S = \frac{1000}{CN} - 10$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$Q = \frac{[(P*K)-(0.2*S)]^2}{[(P*K)+(0.8*S)]} \times \frac{1ft}{12in}$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 0.92
K= Seasonal Precipitation Factor [7]

0.92 inches in the Santa Rosa area, based on local historical data.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	5,803	ft^2
K [7] =	1.2	

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Residential - 1 acre lots
Select post development ground cover description [5] =	Residential - 1/8 acre or less (town houses)
CN_{PRE} =	79
CN_{POST} =	90
OR Composite Predevelopment CN [9] =	89
Composite Post development CN [9] =	89

Solution:

Pre Development Storm Water Runoff Volume

S_{PRE}= 1.24 in

$S_{PRE} = \frac{1000}{89} - 10$

Where:
S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.02765 ft

$Q_{PRE} = \frac{[(0.92*1.17)-(0.2*1.24)]^2}{[(0.92*1.17)+(0.8*1.24)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 160.45 ft^3

V_{PRE}= (0.02765)(5,803)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.19 in

$S_{POST} = \frac{1000}{89} - 10$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02888 ft

$Q_{POST} = \frac{[(0.92*1.17)-(0.2*1.19)]^2}{[(0.92*1.17)+(0.8*1.19)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 167.58 ft^3

V_{POST}= (0.02888)(5,803)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (167.58) - (160.45)

V_{DELTA}= 7.14 ft^3

Where:
Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

INSTRUCTIONS:
If the Design Goal of 100% Capture on page 3 of this calculator is not achieved; then Requirement 1-100% Treatment, page 4 of the calculator, AND Requirement 2- Volume Capture, this page of the calculator, **must** be achieved.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

($C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE}$)

LID BMP Sizing Tool: 100% Volume Capture Goal; V_{GOAL}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ GOAL}=((V_{GOAL}))/(P)$ = 418.98 ft^3

$A_{LID\ GOAL}=(W)(L)$ = 148.50 ft^2

Where:
$V_{LID\ GOAL}$ = Required volume of soil in LID BMP.
$A_{LID\ GOAL}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{GOAL} = 168 ft^3

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	11.0	ft	

Solution:

Percent of Goal Achieved = 106.33 % = [(3.0 x 149) / 419] x 100

INSTRUCTIONS:
The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{LID\ DELTA}=((V_{DELTA}))/(P)$ = 17.84 ft^3

$A_{LID\ DELTA}=(W)(L)$ = 148.50 ft^2

Where:
$V_{LID\ DELTA}$ = Required volume of soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area for a given depth (below perforated pipe if present).

V_{DELTA}= 7.14 ft^3

$$\text{Percent of Requirement Achieved} = \frac{(D)(A_{LID\ DELTA})}{V_{LID\ DELTA}} \times 100$$

Where:
P= Porosity (enter as a decimal)
D= Depth below perforated pipe if present (in decimal feet)
W= Width (in decimal feet)
L= Length (in decimal feet)

Input:

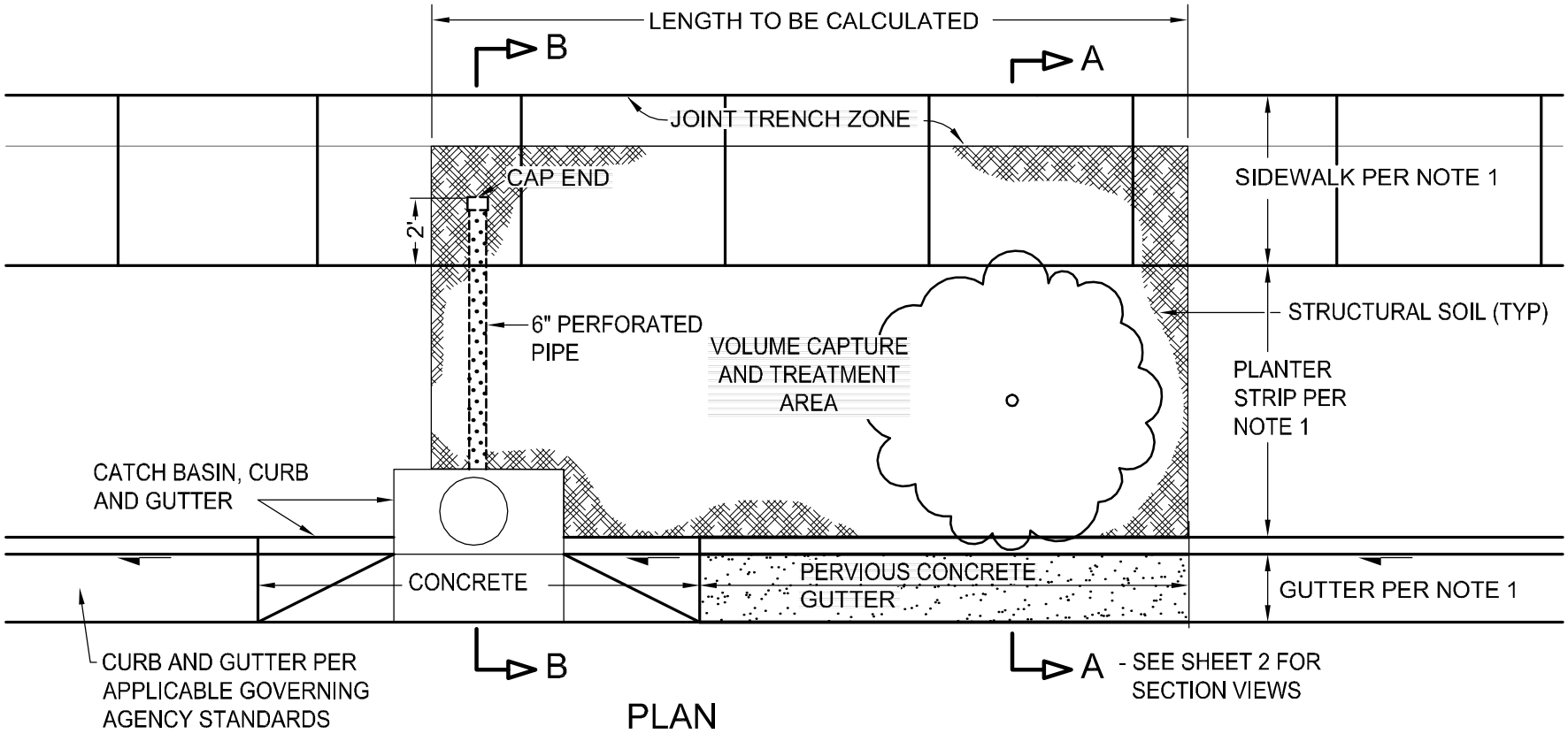
P =	0.4		as a decimal
D =	3.0	ft	Below perforated pipe if present
W =	13.5	ft	
L =	11.0	ft	

Solution:

Percent of Requirement Achieved = 2496.71 % = [(3.0 x 149) / 18] x 100

INSTRUCTIONS:
The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture. Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

BMP DETAILS



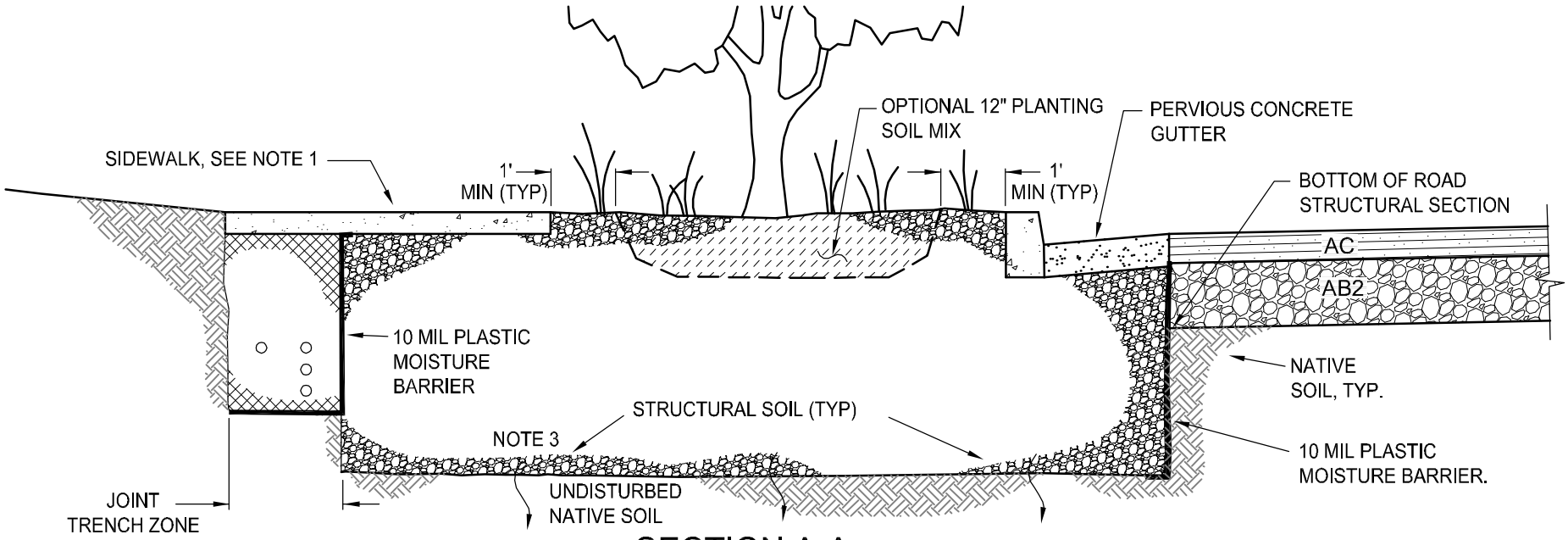
PLAN

NOTES:

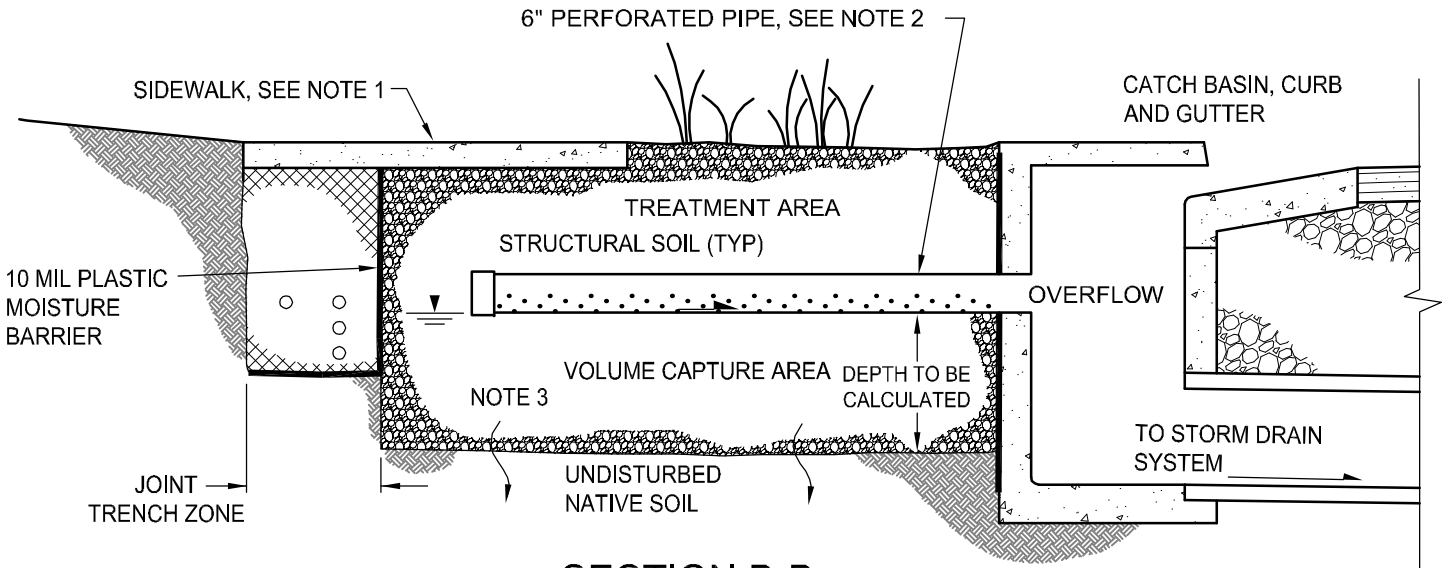
1. SIDEWALK AND PLANTER WIDTHS PER APPLICABLE GOVERNING AGENCY STANDARDS (TYP).

Not to Scale

PRIORITY 2 ROADSIDE BIORETENTION - FLUSH DESIGN		
SCALE: *NONE*	DATE: *05/10/11*	
DWN. *DIT* CHK. *HH*	SHEET 1 of 2	P2–02



SECTION A-A



SECTION B-B

Not to Scale

NOTES:

1. SIDEWALK AND PLANTER WIDTHS PER APPLICABLE GOVERNING AGENCY STANDARDS (TYP).
2. TOP OF 6" PERFORATED PIPE TO BE SET 6" BELOW BOTTOM OF ROAD STRUCTURAL SECTION.
3. BOTTOM OPEN TO ALLOW INFILTRATION INTO NATIVE SOIL.

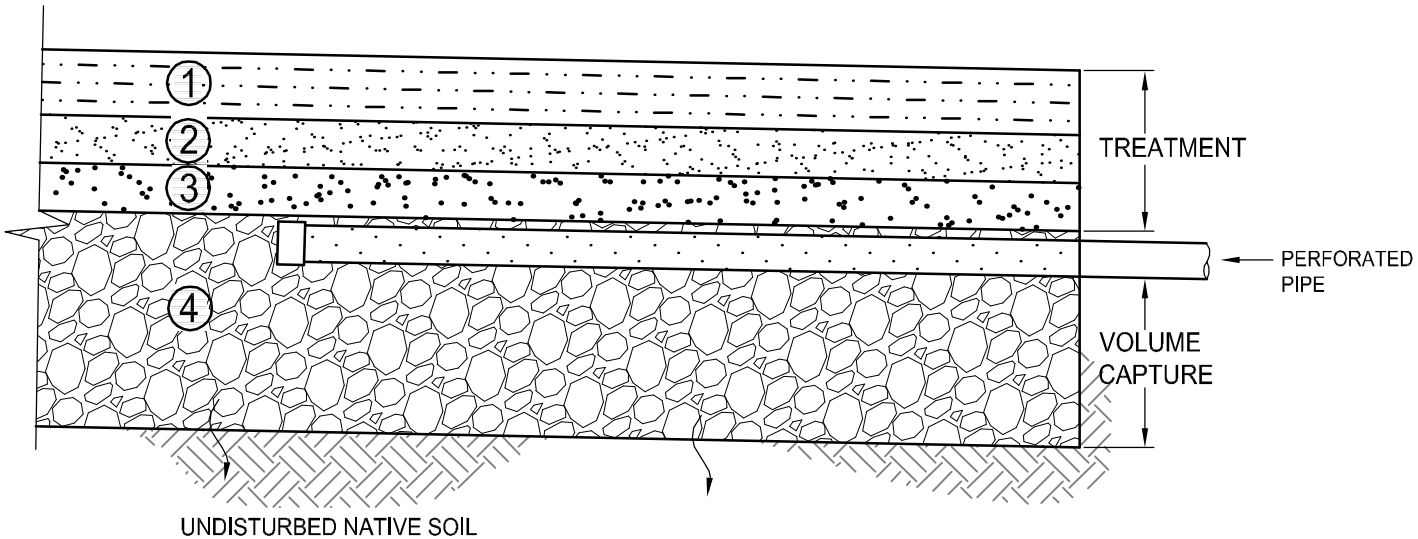
PRIORITY 2 ROADSIDE BIORETENTION - FLUSH DESIGN		
SCALE: *NONE*	DATE: *05/10/11*	
DWN. *DIT* CHK. *HH*	SHEET 2 of 2	P2–02

① PERMEABLE PAVEMENT OR SURFACE PER GOVERNING AGENCY STANDARDS

② SAND LAYER (FINE SAND)

③ TRANSITION LAYER (COARSE SAND) AS NEEDED FOR CONVEYANCE AND TREATMENT

④ STRUCTURAL SOIL OR DRAIN ROCK



Not to Scale

PRIORITY 2 PERMEABLE PAVEMENT		
SCALE: *NONE*	DATE: *05/10/11*	
DWN. *DIT* CHK. *HH*		P2–06

BMP INSPECTION AND MAINTENANCE CHECKLISTS

PLANTER STRIP BIORETENTION- CHECKLIST

Planter Strip Bioretention
Inspection and Maintenance Checklist
(aka: Street Rain Garden, Roadside Bioretention, Bioretention Cell)

Date of Inspection: _____
Inspector(s): _____
BMP ID #:_____
Property Owner: _____

Location Description: _____

Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water in the Bioretention area after 3 days of dry weather?		• Check perforated pipe outlet for obstruction or damage. * • Flush perforated pipe to remove obstructions/sediment. * • Remove and replace the first few inches of topsoil. • Remove soil and inspect perforated pipe. Repair or replace perforated pipe, replace with new soil and regrade.	
		Is water not draining into catch basin from the overflow pipe during a high intensity storm? *			
	PRS RS ARS	Is there sediment visible in the gutter?		• In dry weather, use a mechanical sweeper or a Vactor truck to clean gutter pan.	
	RS	Is there water flowing in the pervious concrete gutter section during a low intensity storm? *		• In wet weather, use a Vactor truck to clean gutter pan.	

* If perforated pipe is present.

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting the planter strip?		• Fill in eroded areas and regrade.	
	RS ARS	Is there channelization (gully) forming along the length of the planter area?		• Fill in eroded areas and regrade.	
	RS ARS	Is there accumulation of sediment (sand, dirt, mud) in the planter?		• Remove sediment and check the grading. Add replacement soil and/or mulch.	
	PRS RS ARS	Is the mulch unevenly distributed in the planter area?		• Redistribute and add additional mulch if needed. • Regrade planter area.	
	PRS RS ARS	Are there voids or deep holes present? Is there sediment present in the catch basin and in the overflow pipe?		• Check the perforated pipe for damage.*	
	PRS RS ARS	Is there evidence of animal activity such as holes or dirt mounds from digging or borrowing?		• Repair and fill in damage areas. • Rodent control activities must be in accordance with applicable laws and do not affect any protected species.	

* If perforated pipe is present.

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		• Trim and/or remove the excess vegetation.	
	PRS RS ARS	Is the mulch distributed evenly throughout the planter area?		• Redistribute and add additional mulch if needed. • Regrade planter area.	
	PRS RS ARS	Are there dead or dry plants/weeds? Is the vegetation over grown?		• Remove dead and/or dry vegetation. Replace as needed. • Remove or trim any vegetation that is causing a visual barrier, trip, and or obstruction hazard.	

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash in the planter area?		• Remove all trash and debris.	
	PRS RS ARS	Is graffiti present?		• Remove all graffiti from the area.	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		• Replace and/or reposition aesthetics features to original placement. • Placement should not disrupt flow characteristics/design.	
	PRS RS ARS	Is the vegetation irrigation functional?		• Repaired broken missing spray/drip emitters. • Reposition and/or adjust to eliminate over spray and/or over watering.	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		• Repair and/or replace loose or damage features.	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		• Remove and replace damaged areas.	

POROUS PAVEMENT- CHECKLIST

Porous Pavement
Inspection and Maintenance Checklist
(aka: Unit Pavers, Porous Concrete)

Date of Inspection: _____
Inspector(s): _____
BMP ID #:_____
Property Owner: _____

Location Description: _____
Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water?		• Check perforated pipe outlet for obstruction or damage. * • Flush perforated pipe to remove obstructions/sediment. * • Repair or replace perforated pipe, replace with new soil and regrade. • Subsurface layers may need cleaning and/or replacing. • In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area. • In wet weather, use a vactor truck to vacuum clean surface area.	
		Is there visible water flowing over the surface of the pervious concrete/pavers during a low intensity storm?			
	PRS RS ARS	Is there sediment visible on the surface of the pervious concrete/pavers?		• In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.	

* If perforated pipe is present.

POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting a planter strip?		• Fill in eroded areas and regrade.	
	PRS RS ARS	Are there cracks, uplifts, slumps, missing pavers, and/or pot holes present? Is there sediment present in the catch basin and in the overflow pipe?		• Check perforated pipe outlet for damage. * • Repair or replace perforated pipe, replace with new soil and regrade.* • Subsurface layers may need cleaning and/or replacing. • Replace or repair damaged areas.	

* If perforated pipe is present.

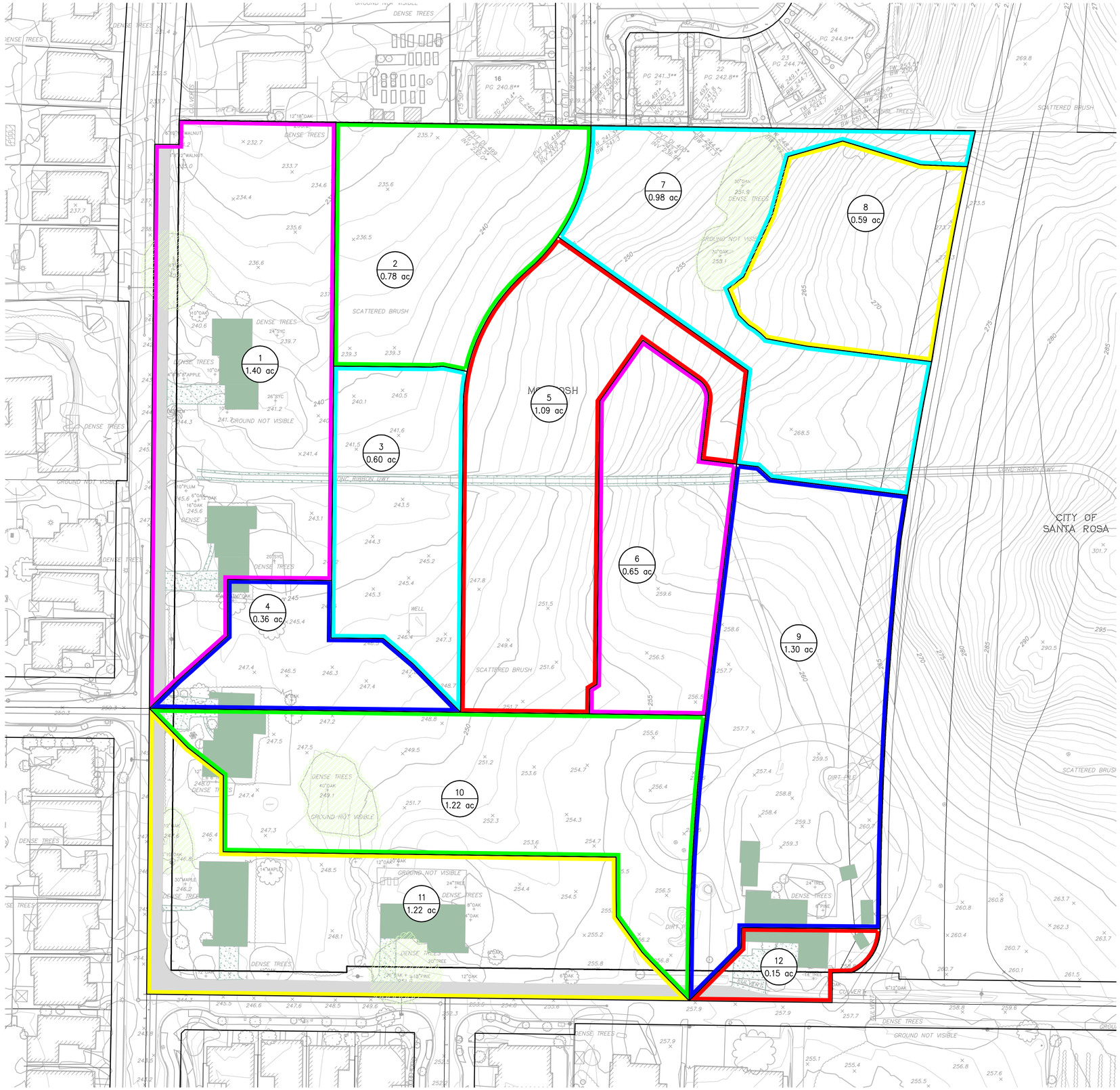
POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		• Trim and/or remove the excess vegetation.	
	PRS RS ARS	Is there vegetation growing in the cracks, stress lines, and/or abutment areas?		• Remove vegetation. • In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area. • In wet weather, use a vactor truck to vacuum clean surface area.	
	PRS RS ARS	Is algae present?		• In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area. • In wet weather, use a vactor truck to vacuum clean surface area.	

POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash area?		• Remove all trash and debris.	
	PRS RS ARS	Is there gum or other material stuck to the pervious surface?		• In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area. • In wet weather, use a vactor truck to vacuum clean surface area.	
	PRS RS ARS	Is graffiti present?		• Remove all graffiti from the area.	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		• Replace and/or reposition aesthetics features to original placement. • Placement should not disrupt flow characteristics/design.	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		• Repair and/or replace loose or damaged features.	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		• Remove and replace damaged areas.	

SUSMP EXHIBIT



LEGEND

EXISTING ASPHALT OFFSITE . . . . . = 0.4 AC

CONCRETE . . . . . = 0.15 AC

ROOFTOP . . . . . = 0.36 AC

EXISTING TREES TO REMAIN . . . . . .

TOTAL EXISTING IMPERVIOUS SURFACE ONSITE = 0.5 AC

TOTAL SITE = 9.73 AC

IMPERVIOUSNESS BEFORE CONSTRUCTION = 5%

TRIBUTARY AREA . . . . . TRIB / AREA

NORTH

0 40 80
scale 1" = 40' feet

EXISTING IMPERVIOUS SURFACES WITH PROPOSED TRIBUTARY AREAS

PENSTEMON PLACE

SANTA ROSA, CALIFORNIA

DECEMBER, 2016

PREPARED BY:

CARLILE • MACY

CIVIL ENGINEERS • URBAN PLANNERS • LAND SURVEYORS • LANDSCAPE ARCHITECTS

15 THIRD STREET, SANTA ROSA, CA 95401
TEL (707) 542-6451 FAX (707) 542-5212

PROJECT No. 2015013.00

SHEET 1 OF 2

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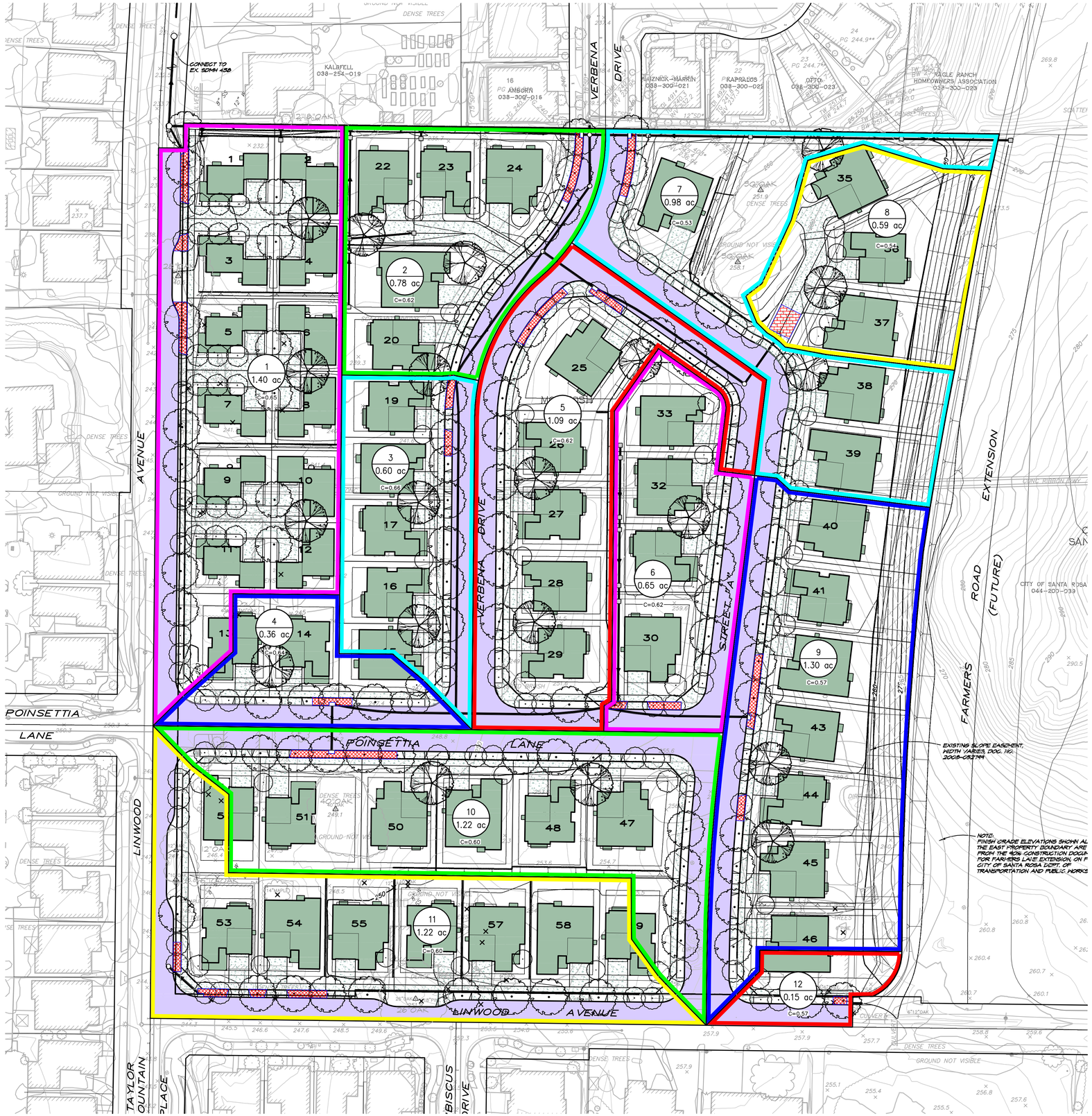
12/1/2016 10:05:49 AM Cindy Valladares Q:\2015\2015013\Drawings-CSD\Exh\SUSMP\15013-EXH-SUSMP-SEPT2016.dwg
[Xref files: 15013-TN-HC; 15013-TP-W-FARMERS; 15013-TW2; 15013-PLPL; 15013-TN-GR; 15013-BNDY]



LEGEND

CONCRETE . . . . . = 1.3 AC

ROOFTOP . . . . . = 2.5 AC

ASPHALT . . . . . = 1.9 AC

TOTAL PROPOSED IMPERVIOUS SURFACE = 5.7 AC

TOTAL SITE = 9.73 AC

IMPERVIOUSNESS AFTER CONSTRUCTION = 59%

BIORETENTION PLANTER . . . .

PERMEABLE PAVERS . . . . . .

TRIBUTARY AREA . . . . . TRIB AREA C-VALUE

NORTH

0 40 80
scale 1" = 40' feet

PROPOSED IMPERVIOUS SURFACES, BMP'S, AND TRIBUTARY AREAS

PENSTEMON PLACE

SANTA ROSA, CALIFORNIA

DECEMBER, 2016

PREPARED BY:

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[Xref Files: 15013-TM-HC; 15013-TP-W-FARMERS; 15013-TM2; 15013-PLPT; 15013-TM-GR; 15013-BNDY]

ATTACHMENT I-1

DRAINAGE AREAS & STORM DRAIN CONNECTIONS

Penstemon Place

Carlile - Macy
December, 2016

DRAINAGE AREAS + STORMDRAIN CONNECTIONS

PENSTEMON PLACE

SANTA ROSA, CALIFORNIA

DECEMBER 2016

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SHEET 1 OF 1

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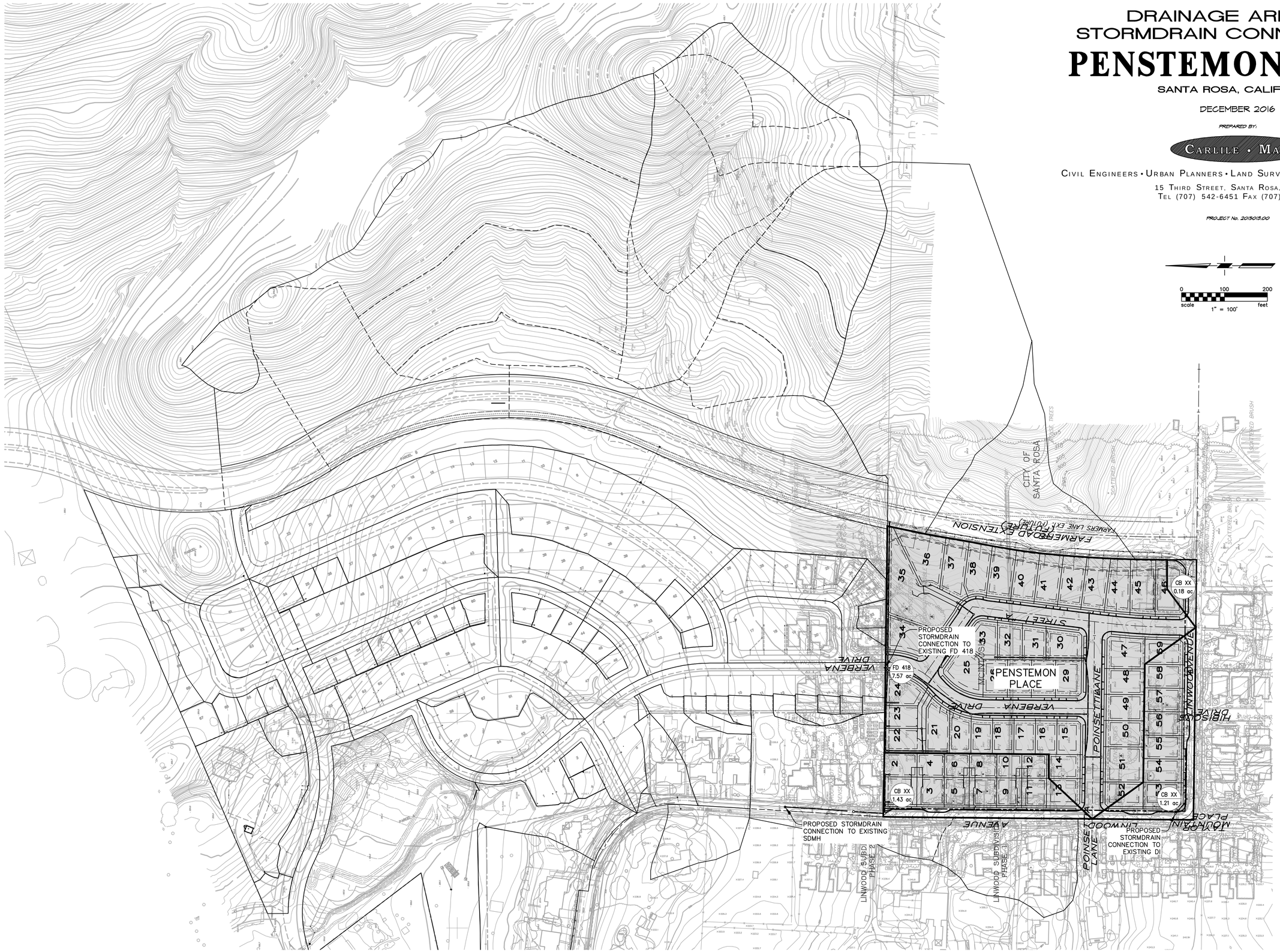

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