TABLE OF CONTENTS

Introduction

Through Chapter 36 of the Sonoma County Code (Code), the Sonoma County *New Vineyard and Orchard Development, Vineyard and Orchard Replanting, and Agricultural Grading and Drainage Regulations* (VESCO), the Land Stewardship Division of the Sonoma County Department of Agriculture/Weights & Measures (Department) regulates new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage in order to minimize erosion and control potential impacts to the surrounding environment due to agricultural activities in Sonoma County. There are numerous environmental, economic, and agricultural costs of erosion. Through the VESCO permitting process and associated Best Management Practices (BMPs), erosion and sedimentation due to new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage activities can be mitigated. The context of this manual includes the design and implementation of plans that minimize soil erosion and the mobilization of sediment into streams and other bodies of water during new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage. Erosion and sedimentation are most successfully managed through the implementation of various BMPs during each stage of the project. Through proper planning and the implementation of the BMPs outlined in this manual, both temporary and permanent impacts can be managed throughout the stages of development work, as required by VESCO.

Manual Purpose and Scope

This manual is designed to provide general guidance for implementing BMPs that will eliminate or reduce the erosion of soil and the mobilization of sediment from new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage projects in accordance with the standards set by Article 20 of VESCO. This manual also provides guidelines for preparing technical reports and describes when they are required.

This manual provides BMPs for project planning and initial design, project design, and project construction of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage.

Once a vineyard or orchard is planted or replanted, *The Land Steward's Guide to Vineyard and Orchard Erosion Control*, also prepared by the Department, is a guide available to assist vineyard and orchard operators with general principles of erosion control.

Manual Organization

Chapter 1: Project Planning and Initial Design

Recommended BMPs for each phase of project implementation. The BMPs in Chapter 1 are described in the subsequent chapters.

Chapter 2: Project Design – Agricultural Drainage

BMPs for constructed drainage systems, as well as those used to configure site drainage patterns to limit post-development stormwater runoff and erosion.

Chapter 3: Project Design – Agricultural Road Network

BMPs for the design of agricultural roads and avenues to minimize erosion and control sediment.

Chapter 4: Project Design – Tree Removal

Applies to projects proposing the removal of more than one-half acre of tree canopy or which already removed more than one-half acre of tree canopy since November 2008.

Chapter 5: Project Construction

Describes the erosion and sediment control practices recommended to be implemented during any work that may cause earth disturbance, including new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage work.

Appendices

- Appendix 1: Geologic Report Guidelines
- Appendix 2: Geotechnical/Soils Report Guidelines
- Appendix 3: Drainage Report Guidelines
- Appendix 4: Biotic Resource Assessment and Focused Species Assessment Guidelines
- Appendix 5: Wetlands Report Guidelines
- Appendix 6: Reference Materials for USLE Calculations
- Appendix 7: Standard Notes
- Appendix 8: Glossary

Chapter 1: Project Planning and Initial Design

Prior to beginning any earth-disturbing work, all stages of the project must be planned to minimize soil erosion and the mobilization of sediment into streams and other bodies of water. This includes incorporating the BMPs described in this manual into the planning, design, and construction of a project. This chapter will assist with planning the details of a project by outlining the BMPs required to be implemented throughout the project development process, while the subsequent chapters provide details on each BMP.

Step 1: Define Project

The first step in project planning is to clearly define the conceptual scope and physical boundaries of the project.

Step 2: Review and Evaluate Site Features

Key site features that must be evaluated, shown on plans, and their proper management incorporated into site design include, at a minimum:

- Soil type(s)
- Soil conditions
- Ridgetops
- Hydrologic patterns
- Lakes/ponds
- Springs
- Vegetation/trees
- Property lines
- Reservoirs
- Wetlands
- Areas of instability
- Setbacks
- Watercourses/riparian areas
- Existing roads and access
- Existing drainage system
- Slope gradient/orientation

In order to determine the existence and extent of many of these features and their association with a proposed new vineyard or orchard development, vineyard or orchard replanting, or agricultural grading or drainage project, technical reports may be required. Refer to Appendices 1 – 5 of this manual for guidelines on preparing professional reports to inform the proposed project.

Step 3: Select BMPs

For BMPs to be effective in controlling nonpoint source pollution, they must be properly designed, sited, installed, and maintained. Proper design includes making sure the selected BMP will achieve the desired result. The BMP should be sited in the best location to achieve maximum pollutant removal and installed in such a manner that it will function properly. BMP structures that are not maintained will most certainly fail.

BMPs for Project Design

The following BMPs are required to be incorporated into the design of Agricultural Drainage and Agricultural Road Network projects, as shown in Table 1 below, in order to minimize soil erosion and the mobilization of sediment from a project area. The BMPs are prescribed per project type, below, and detailed in Chapters 2 – 4 of this manual. When properly installed and maintained, these BMPs will limit post-development stormwater runoff and the discharge of soil and other pollutants, as required by Section 36.20.130 of VESCO.

While not identified explicitly in Table 1, below, it should be understood that new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading projects involving any of the project features listed below must additionally incorporate the required BMPs into project design, as applicable.

Table 1. BMPs to be incorporated into project design for permanent erosion and sediment control.

Project Feature	**BMP**	
Drainage feature	Sheet flow Drainage swale Sediment collar	Velocity dissipation device Sediment basin
Agricultural roads and avenues	Outsloping Insloping Crowning Limit slope lengths	Rolling dip Critical dip Water bar Inboard ditch and ditch relief culvert

BMPs for Project Construction

Regardless of the project type, the following BMPs must be implemented during project construction to limit the potential for erosion and the transport of sediment and other pollutants during construction. The BMPs required to be implemented are dependent, in part, on the phase of the project, as explained in Chapter 5 of this manual.

Table 2. BMPs to be implemented during project construction for temporary erosion and sediment control.

BMP Type	**BMP**	
Non-structural	Scheduling Preservation of existing vegetation Waste management	Stockpile management Stabilized construction entrance Equipment staging
Erosion control	Straw mulch Cover crops Geotextiles and mats	Vegetative stabilization Hydraulic mulch Hydroseeding
Sediment control	Fiber rolls Straw bale barriers	Check dams

As always, retain the services of a professional when contemplating engineered solutions.

Step 4: Execute Project

Chapter 2: Project Design – Agricultural Drainage

As defined in VESCO, agricultural drainage is any drainage alteration for agricultural purposes other than for private roads and driveways, dams, reservoirs, lakes, ponds, and structures; drainage alteration is construction or modification of drainage facilities or systems; drainage facilities are constructed components of drainage systems; and drainage systems are *constructed and/or natural features that work together to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat, or filter stormwater runoff, including detention and retention basins, overland flow paths, pipes, channels, and the inlets and outlets to these features*.

Drainage facilities and systems, excluding those involving agricultural roads and avenues which are covered in Chapter 3 of this manual, shall be designed in accordance with this chapter and Sections 36.20.030 and 36.20.130.C of VESCO to **maintain natural and existing drainage patterns, maximize infiltration, minimize erosion, and limit the discharge of soil and other pollutants**.

It must be noted that while this chapter details BMPs to be incorporated into the design of drainage facilities and systems, the erosion and sediment control BMPs described in Chapter 5 of this manual are to be implemented during the construction of drainage facilities and systems.

Drainage Patterns and Runoff

In accordance with Section 36.20.030.A of the VESCO, all new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage shall be designed and constructed to maintain natural and existing drainage patterns and limit post-development stormwater runoff. Drainage alterations shall not increase the total amount of runoff in a given tributary area.

Drainage Activities Exempt from Permit Requirements

Certain agricultural drainage activities, such as minor pipe and v-ditch swale systems, may be conducted without obtaining an agricultural drainage permit, provided the activities comply with the standards in Article 20 of VESCO and incorporate the BMPs described in this manual into final design.

A complete and detailed list of the agricultural drainage activities exempt from permit requirements can be found in Section 36.12.010.C of VESCO.

Existing Drainage Facilities and Systems

While not permitted by the Department, existing drainage facilities and systems will be reviewed with VESCO applications to ensure compliance with the standards in Article 20 of VESCO.

Review Existing Conditions

Check existing inlets and outlets for signs of erosion and deposition of sediment. Table 3 below lists potential corrective actions to be implemented to correct observed deficiencies of the existing drainage facilities or system. Any modifications to the existing drainage facilities or system shall be completed in accordance with the following sections of this chapter.

Table 3. BMPs to be implemented during project construction for temporary erosion and sediment control.

Observation	Feature	Potential Corrective Action
Erosion	Inlet	Install additional inlets to break up flow lengths
	Outlet	Install velocity dissipation device
Sediment deposition	Inlet	Modify inlet(s) to include a sediment collection component
	Outlet	Install sediment basin, if warranted

**Note: The Department is not the permitting agency for areas located within the jurisdiction of state and federal resource agencies. If it is determined that an existing drainage system located within the jurisdiction of state and federal agencies requires modification, consult with the appropriate agencies.*

Prepare Drainage Analysis

When proposing to expand the tributary of an existing drainage system, analysis must be provided that the existing system has adequate capacity to handle the increased flows. This analysis shall be prepared in accordance with the Drainage Report Guidelines in Appendix 3 of this manual and include an analysis of all components of the drainage system, both existing and proposed. If an existing drainage system is found to be undersized for the design flow, a hydraulic and erosion analysis must be provided for overland flow of the excess water. In addition, existing drainage systems that discharge to a stream must demonstrate that the drainage system will not cause downstream erosion.

Design of Drainage Facilities and Systems

Drainage systems designed to manage stormwater runoff shall be designed to encourage overland sheet flow, utilizing existing natural features to convey stormwater flows whenever possible.

Overland Sheet Flow

Where overland sheet flow is a selected drainage pattern, an analysis of pre- and post-development sheet flow shall be provided in accordance with the Drainage Report guidelines presented in Appendix 3 of this manual, or an alternative published and peer reviewed method. The sheet flow analysis must determine if and when overland sheet flow will become shallow concentrated flow. Flow velocities that exceed five cubic feet per second (cf/s) on non-highly erodible soils or three cf/s on highly erodible soils are considered to be erosive and must be redirected/redesigned to control erosion.

Constructed Drainage Systems

Constructed drainage systems are generally comprised of the following three components: inlets, conveyance, and outlets. Should a constructed drainage system be selected for the proposed development, vegetated swales are encouraged over-use of pipes. The following BMPs shall be incorporated into plans for drainage alteration when any of these components are proposed.

Inlets

Where stormwater runoff is conveyed in a constructed drainage system that utilizes inlets to collect surface runoff, inlets shall be designed to limit surficial erosion and prevent the discharge of sediment. To limit erosion, inlets shall be spaced such that runoff is captured before flows concentrate to a potentially erosive level. Flow velocity can be determined using the method presented in the Drainage Report guidelines in Appendix 3 of this manual. To limit the discharge of sediment, inlets are to contain a sediment collection component, such as a sediment collar, to collect entrained sediment prior to flows entering the conveyance facility. A sediment collar consists of a corrugated plastic pipe collar placed around the pipe.

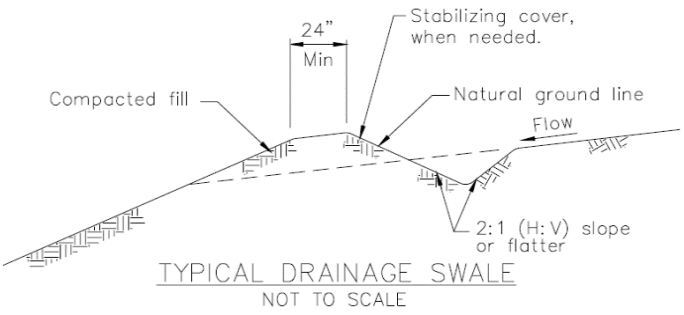
The accepted method to size and install a sediment collection device includes the following steps:

- Specify the material type.
- Specify the horizontal dimensions.
- Max cut-slope gradient for sediment trap sidewalls is 2:1, which will affect horizontal dimensions. Show horizontal dimensions for 15-45% slopes.
- Increase elevation difference between drainpipe and sediment collection sump inlets from 3 to 6 inches.
- The collection area (sump) must be a minimum of 6 inches deep.

If an alternative method is utilized to size and install a sediment collection device, it must be shown that the alternative method meets the minimum criteria.

Conveyance Facilities

Conveyance facilities are used to divert stormwater runoff from the surface and convey it to a stabilized outlet. Those that are primarily utilized for agricultural drainage alteration include surface interceptor drains and rock or grass-lined swales. Conveyance facilities such as surface interceptor drains do not control erosion and the movement of sediment, however they prevent erosion by directing runoff to a stable outlet and/or by directing runoff away from erodible areas. Drainage facilities and systems are required by Section 36.20.030.B.1 of VESCO to be designed for no less than the 25-year design discharge, as defined in the Flood Management Design Manual.



TYPICAL DRAINAGE SWALE
NOT TO SCALE

NOTES:
1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.

Rock or Grass-Lined Swales

A constructed swale is a shaped and sloped depression in the soil surface designed to collect stormwater runoff and convey it to a stable outlet. Swales are to be armored with rock or lined with grass or a geotextile or mat described in Chapter 5 of this manual, to prevent the erosion of newly-graded surfaces.

Outlets and the Disposal of Stormwater Runoff

As conveyance facilities increase concentrated flows and increase flow velocities, outlets must be designed to reduce flow velocity of stormwater exiting the conveyance facility before it is discharged and minimize the potential for scouring and erosion. Depending on the flow velocity exiting a conveyance facility, numerous discharge points may be needed to avoid the erosive effects from discharge of concentrated flow. It should be noted that sub-drain outfall locations must also be reviewed for compliance with the standards in Article 20 of VESCO.

As prescribed by VESCO, all new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage, including drainage system outlets, are required to maintain setbacks. Direct discharge to creeks, streams, neighboring parcels or County rights-of-way is also prohibited.

The two outlets typically used in agricultural drainage systems are velocity dissipation devices and sediment basins, as described below.

Velocity Dissipation Devices

Velocity dissipation devices require the placement of rock, riprap, or other material at the outlet of the conveyance facility to reduce flow velocity of existing storm water discharge. Rock outlet protection serves to trap sediment and reduce flow velocities and is usually less expensive and easier to install than concrete aprons or energy dissipaters. While there are many types of materials that can be used for velocity dissipation devices, best results are obtained when sound, durable, and angular rock is used.

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity must be considered in the outlet design. General recommendations for rock size and length of outlet protection are shown in Table 4, below, and should be considered minimums. The apron length and rock size gradation are to be determined using a combination of the discharge pipe diameter and estimated discharge rate. It is important to select the longest apron length and largest rock size suggested by the pipe size and discharge rate. For larger or higher flows than those shown in the table below, consult a civil engineer.

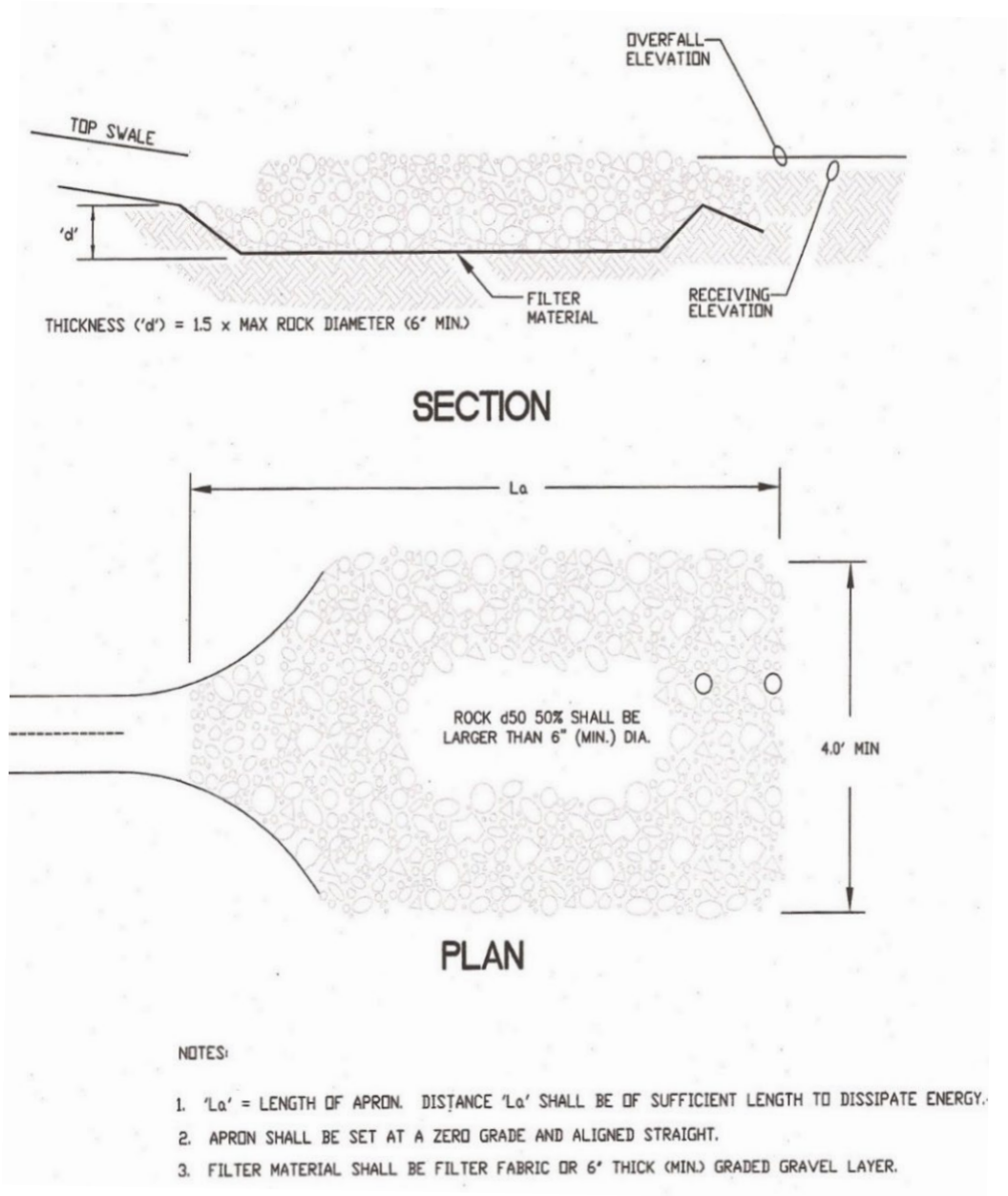
Where flows are conveyed in open channels such as v-ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be the same as the culvert or channel design flow but never less than the peak 5-year flow for temporary structures planned for one rainy season, or the 10-year peak flow for temporary structures planned for two or three rainy seasons.

Table 4. Apron length and rock size base on pipe size and discharge rate (source: USDA – SCS).

Pipe Diameter (in)	Discharge (ft^3/s)	Apron Length, La (ft)	Riprap d_{50} Diameter (in)
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

Carefully place riprap to avoid damaging the filter fabric. Stone 4 inches to 6 inches may be carefully dumped onto filter fabric from a height not to exceed 12 inches. Stone 8 inches to 12 inches must be hand placed onto filter fabric, or the filter fabric may be covered with 4 inches of gravel and the 8 inches to 12 inches rock may be dumped from a height not to exceed 16 inches. Rocks greater than 12 inches shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one-half the D50 rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

For proper operation of the apron, align the apron with the receiving stream and keep it straight throughout its length. If a curve is needed to fit site conditions, place it within the upper section of the apron. Outlets on slopes steeper than 10 percent should have additional protection.



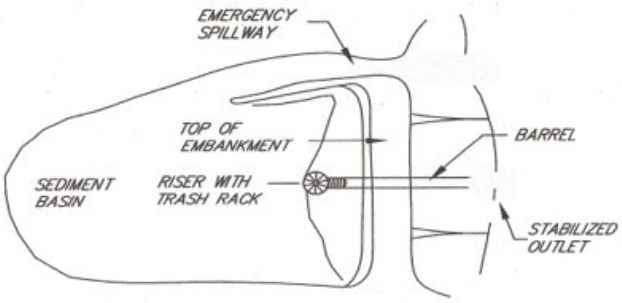
Sediment Basins

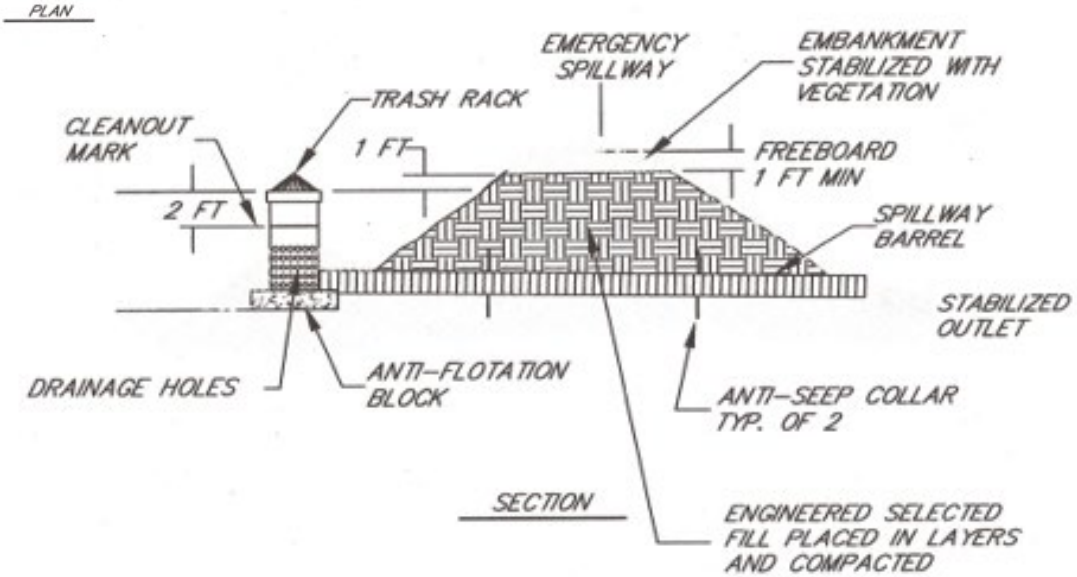
A sediment basin is a basin formed by excavation or by constructing an embankment such that sediment-laden runoff is temporarily detained, allowing sediment to settle out of the runoff before it is discharged.

Sediment basins can be installed for temporary (e.g. during construction) and permanent purposes and must be designed by a civil engineer. They are generally limited to drainage areas greater than 5, but less than 75 acres.

Design sediment basins to drain within 72 hours following storms. The length of the basin should be more than twice the width of the basin, determined by measuring the distance between the inlet and the outlet.

To prevent the potential for erosion of the sediment basin, protect all exposed slopes using rock, vegetation, or an erosion control product detailed in Chapter 5 of this manual. Install a velocity dissipation device at the outlet of the sediment basin to prevent erosion and scouring of the outlet channel.





NOTES:

1. THE TEMPORARY SEDIMENT BASIN, DESIGNED BY A QUALIFIED PROFESSIONAL, IS REQUIRED FOR DISTURBED AREAS GREATER THAN 5 ACRES WITHIN A DRAINAGE AREA LESS THAN 100 ACRES.
2. THE SEDIMENT BASIN WILL BE REMOVED WITH- IN 3 YEARS.

Chapter 3: Project Design – Agricultural Road Network

As defined in VESCO, agricultural road network is the agricultural roads and avenues serving a vineyard or orchard; agricultural roads are year-round roads that connect vineyard and orchard blocks; agricultural avenues are seasonal roads around or through vineyard or orchard blocks, or areas at the end of vine or tree rows where vehicles and equipment can turn around.

Agricultural roads and avenues are especially susceptible to impacting natural stream channels as roads and their drainage systems are often hydrologically connected to watercourses through runoff from surfaces and ditches, and as they are generally located at the edges of vineyard blocks, they thereby must manage surface runoff from upslope vineyards.

Agricultural roads and avenues and their associated ditches, cutbanks, and fill slopes must be designed and constructed in accordance with Sections 36.20.030, 36.20.070, and 36.20.130.C of VESCO to **maintain natural and existing drainage patterns**, **maximize infiltration**, **minimize erosion**, and **limit the discharge of sediment** by utilizing the BMPs presented in this chapter. In addition, as they are key elements of vineyard and orchard infrastructure, both agricultural roads and avenues and any associated structures must be set back from existing natural features in accordance with the setbacks prescribed in Sections 36.20.080 – 36.20.120 of VESCO.

In addition to utilizing the BMPs described in this chapter, prior to any road construction or modification, it is recommended to consult the *Handbook for Forest, Ranch & Rural Roads*[1] for additional guidance.

Existing Roads

When a project proposes to utilize an existing access feature (road, stream crossing, etc.) as part of the agricultural road network, **the access feature in its current state must be functional for the intended use**, i.e. appropriately designed for intended equipment, vehicles and levels of service.

[1] http://www.pacificwatershed.com/sites/default/files/roadsenglishbookapril2015b_0.pdf

Access features that require improvements to serve the intended use shall be considered to be part of development and can be modified as part of the project, subject to the following limitations:

- All proposed improvements shall be shown on the project plans;
- Improvements must comply with the standards of this chapter;
- Existing roads that serve the project, but that do not qualify as agricultural roads or avenues are not considered part of the development permitted by the Department; and
- Modifications to existing roads located within a setback area are not permitted by the Department*.

**Note: The Department is not the permitting agency for modifications to existing roads located within the jurisdiction of state and federal resource agencies. If it is determined that an existing road located within the jurisdiction of state and federal resource agencies requires modification, consult with the appropriate jurisdictional agency.*

Existing Stream Crossings

Show on the project plans all existing road stream crossings that are proposed to serve the development. For stream crossings that require improvements in order to serve the development, indicate the proposed improvements within the setback area that are not a part of the development along with a note stating all necessary permits from local, state, and federal agencies will be acquired prior to making any improvements. Improvements to existing crossings are not under the permitting authority of the Department.

General Considerations for New Agricultural Roads and Avenues

The key to successfully managing surface runoff from agricultural roads and reducing the degree of hydrologic connectivity is to direct the flows off the road surface, and away from cut slopes and fill slopes of the road as quickly as possible, before flows can concentrate and cause erosion. This can be achieved by incorporating the following standards for surface and drainage system design. During construction of agricultural roads and avenues, the BMPs presented in Chapter 1 of this manual shall be employed.

Roads are typically used year-round to convey workers and equipment, and are generally rocked or paved, whereas avenues are seasonal, primarily dirt or grass and must be winterized in accordance with Section 36.20.150 of VESCO and Chapter 5 of this manual. Agricultural avenues, by contract, are most often used seasonally and typically follow the contours of the blocks they transverse. As such, they generally do not need to be designed in accordance with the following standards and shall be managed in accordance with the principles described in Chapter 2 of this manual. Additionally, if properly winterized in accordance with Chapter 1 of this manual, the vegetated surface of agricultural avenues limits the potential for surface erosion during the rainy season.

Surface Design

As described above, the primary goal of road design is to remove the surface runoff from the road surface as quickly as possible. However, surface runoff must additionally be manipulated in such a manner that stormwater runoff is diffused prior to its released to any setback area or off the site and erosion of the road surface and disposal location is limited in compliance with Sections 36.20.030.C and D of VESCO.

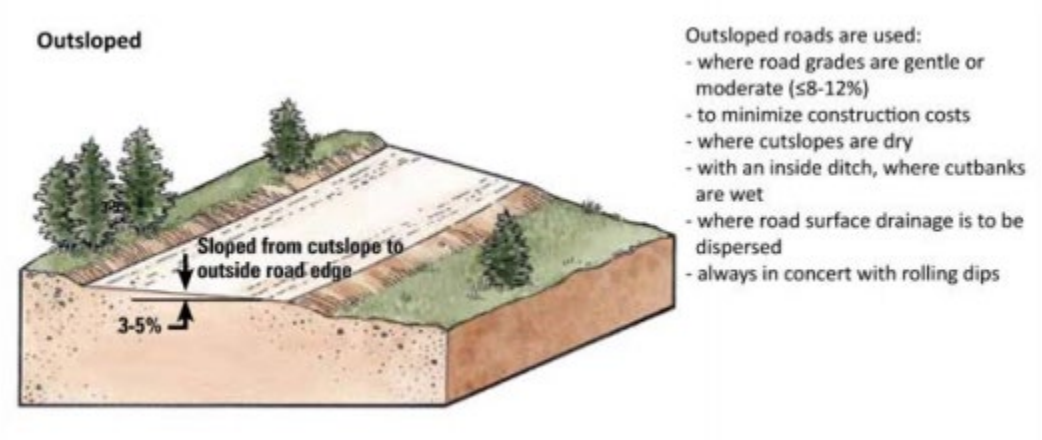
The slope of the road surface can be manipulated to control the direction of surface runoff through the following:

- Outsloping
- Insloping
- Crowning
- Limiting slope lengths

Outsloping

Outsloping allows for runoff to be dispersed and drained as sheet flow along the entire outside edge of the road and generally causes the least disturbance and soil movement. They are often less expensive to construct than other road features, easier to maintain, and do not require the construction of additional drainage features like ditches, berms, or water bars. As outsloped roads promote even draining of the road surface, erosion of the surface and disruption of the natural sheet flow pattern of the surrounding landscape are minimized.

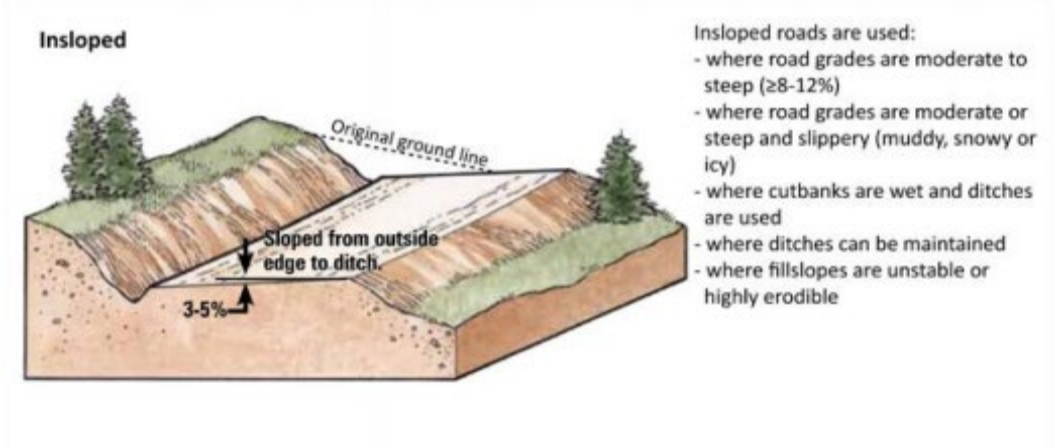
Outsloped roads utilize rolling dips, detailed below, at changes in slope, to keep flows hydrologically disconnected and limit stormwater flow lengths. The desired shape of an outsloped road should have at least a four percent slope from the cut bank to the outside edge of the road. This can be achieved by removing any outboard berm, lowering the outboard side of the road and using pulled fill material to raise the inboard side of the road and fill the inboard ditch.



Insloping

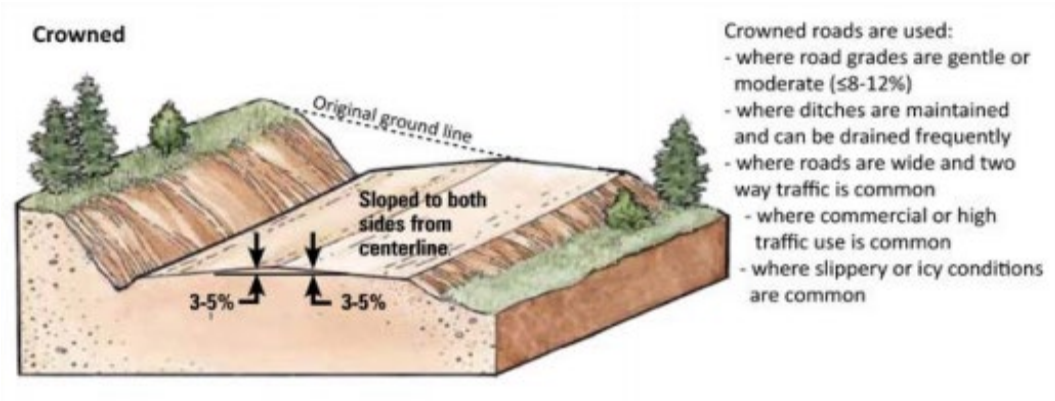
Insloped roads are to be utilized when flows from hillsides and cut slopes need to be kept off the road surface because it is unstable, or it is located next to a stream. Insloped roads drain surface runoff to the inside of a roadbed where it can be conveyed in an inboard ditch to a ditch relief culvert (described below) with an outlet stabilized in accordance with Chapter 2 of this manual.

A properly constructed and well-maintained ditch is a key component of this design. Inboard ditches should be drained at intervals sufficient to prevent ditch erosion, which could lead to the transport of sediment into a nearby watercourse.



Crowning

In some cases, a combination of insloped and outsloped designs are used in crowned roads. This design is suitable for scenarios where the inboard ditch is not sufficient to handle 100 percent of flows from the roadbed and flows across the road surface are anticipated. Crowned roads allow the ditch to convey flows from the hillside and cut bank areas, while the outsloped side of the road can facilitate sheet flow across the road surface.

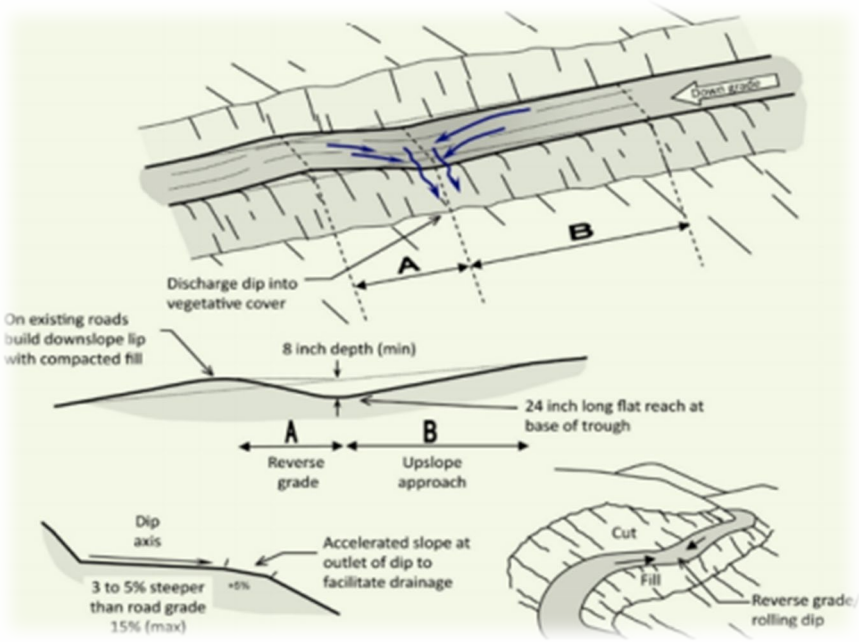


Limiting Slope Lengths

Limiting slope lengths is key to limiting erosion and post-development stormwater runoff from road surfaces. Utilize rolling dips on permanent and seasonal roads or water bars on seasonal or temporary unsurfaced roads at frequent intervals to disperse road surface runoff from steep road segments. These drainage structures are described in the following section.

Drainage Structure Design

Road drainage structures are designed to convey stormwater runoff across or away from road surfaces, while limiting post-development stormwater runoff, erosion, and pollutant discharges. These structures include rolling dips, water bars, ditches, and ditch relief culverts.



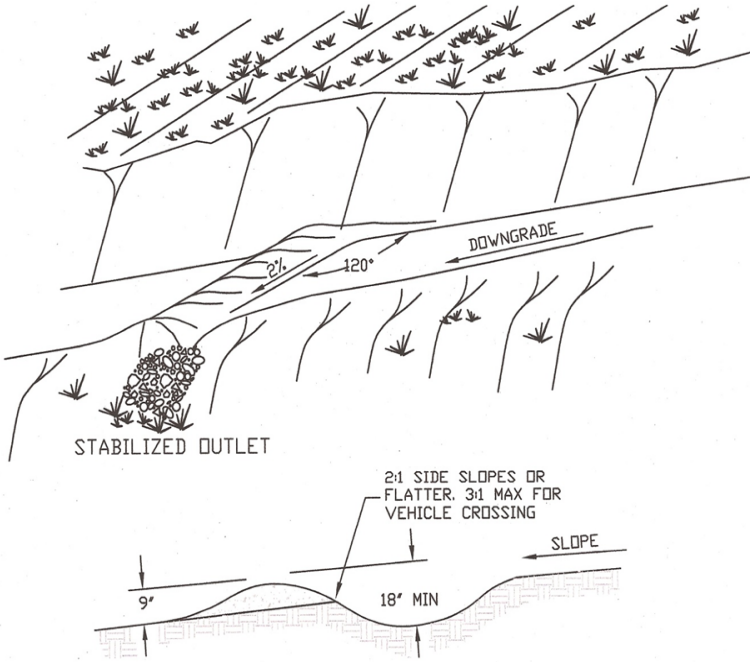
Rolling Dips

Rolling dips are designed to drain surface runoff away from the road surface and unlike water bars, described blow, they are meant for highly traveled roads. While they may be used for insloped or crowned roads, the goal of effective drainage is to disperse, rather than collect and concentrate road runoff. They are usually installed perpendicular to the road alignment with a cross slope of 3 percent to 5 percent greater than the road grade and should drain onto the outboard side of the road. Rolling dips are limited to slopes of less than 12-14 percent and require that any outside berm be removed for the entire length of the rolling dip. The outlet of the rolling dip shall be protected with rock, logs, branches, or brush to disperse runoff and minimize erosion.

Construction of frequently installed rolling dips will ensure the most reliant form of road drainage with the least amount of maintenance. On average, rolling dips should be constructed such that each captures no more than 150 feet of road drainage. The spacing of rolling dips, their effect on hydrologic connectivity, and factors influencing discharge points are best determined by a civil engineer.

Water Bars

Water bars are shallow, abrupt, excavated dips or troughs with an adjacent, downslope hump or mounded berm and utilized in a similar manner to rolling dips, to reduce the hydrologic connectivity of a road segment and divert surface runoff to stable outlets. In contrast to rolling dips, however, water bars are recommended on agricultural roads that cannot accommodate rolling dips, or on seasonal roads and avenues that are not utilized during the rainy season, as they can be easily rendered dysfunctional by vehicle traffic. Water bars require a high level of maintenance and are to be inspected after each rain event, or more often as needed.



They are oftentimes temporary structures that are regraded at the beginning of each operating season in which the road is to be utilized more frequently and then reconstructed prior to the beginning of the rainy season.

Inboard Ditches and Ditch Relief Culverts

Inboard ditches are generally utilized on insloped or crowned roads to capture surface runoff as well as flows from the adjacent hillsides or cut slopes. Road ditches that drain directly to stream crossing culvert inlets are typically the most common and important source of hydrologic connectivity between roads and streams. As such, ditch flow lengths should be minimized, especially in cases of hydrologic connectivity to limit the transport of sediment delivered to stream crossings. Line ditches with vegetation or a rolled erosion control material described in Chapter 5 of this manual, to prevent erosion of newly-graded surfaces by concentrated flows and encourage the deposition of sediment.

Ditch relief culverts should be installed at intervals along the road that are close enough to minimize erosion of the inboard ditch and the native hillslope below the culvert outlet, and at locations where collected water is dispersed onto stable areas away from watercourses. Refer to Forest Practice Rules for DRC spacing.

Chapter 4: Project Design – Tree Removal

As defined in VESCO, tree removal is the removal of more than one-half acre of tree canopy within a new planting area. Projects must adhere to the following BMPs and standards when proposing the removal of more than one-half acre of tree canopy or if more than one-half acre of tree canopy has been removed since November 2008.

Trees help stabilize and protect the land through the combination of canopy and roots. The conversion of tree-covered hillsides into vineyards and orchards has the potential to cause soil loss through an increase in soil erosion[2] and can increase the potential for slope instability. The following best management practices have been designed to reduce the velocity and quantity of runoff and maintain the natural drainage patterns to the extent feasible, when tree removal is proposed.

Prohibitions

Tree removal is prohibited in the following areas:

- In mapped areas of potentially non-cohesive soils, where existing slopes are between 25 and 40 percent and a geologic report, prepared in accordance with the guidelines in Appendix 1 of this manual, concludes that the factor of safety after tree removal will be less than 1.5 under saturated conditions;
- On existing slopes steeper than 40 percent with non-cohesive soils; or
- On identified areas of instability – unless the area is repaired in accordance with VESCO and details of the repairs are shown on the project plans.

General Requirements

All tree removal projects must adhere to the setbacks from the areas of instability and ridgetops detailed in Sections 36.20.080 and 36.20.100 of VESCO. In addition, project engineers must determine existing tree canopy and ground cover, as follows.

Pre-Development Tree Canopy

For projects that have removed trees or other vegetation since November 2008, pre-development cover (canopy) levels will be determined using the aerial photos available at www.sonoma-county.org/prmd/activemap, or alternative aerial photos as approved by the agricultural commissioner. Pre-development tree canopy can be determined using one of the two following methods:

- Canopy cover determined and reported prior to operations by a Registered Professional Forester; or
- The area determined from an existing aerial photograph.

[2] USDA Soil Conservation Service. 1975. Guides for erosion and sediment control. Davis, CA: USDA SCS.

Pre-Development Ground Cover

Ground cover can be considered all materials in contact with the soil surface. This mainly consists of rock fragments, portions of live vegetation including basal area and plant leaves that touch the soil, plants and plantlike organisms, such as mosses, algae, ferns, fungi, duff, plant litter, crop residue, applied materials, including manure, mulch, and manufactured erosion control products.

A sampling procedure placed in a uniform grid shall be used to determine the ground cover of the area prior to operations. Plots shall be placed on a 50 foot x 50 foot grid or a minimum of 10 plots per contiguous area. Ground cover shall be measured from the percent bare soil covering the circle relative to the area absent of bare soil within a 1/300th acre circle (6'8"). Ground cover shall be determined from the average amount of cover within each plot, within the project area.

Level II Project Requirements

Geologic Report

A geologic report prepared by a professional geologist in accordance with the Guidelines for Preparing Geologic Report in Appendix 1 of this manual is required for all Level II projects proposing tree removal to identify and characterize all areas of instability. In addition, for sites with existing slopes greater than 25-percent in mapped areas of potentially non-cohesive soils, the professional geologist shall review the site for non-cohesive soils. A non-cohesive soil, as defined by VESCO, is a soil where the particle size of the smaller than 2mm fraction of the soil is coarser than Loam as defined by the Natural Resources Conservation Service soil texture classification scheme. A list of potentially non-cohesive soils and procedures for determining cohesion properties of soil are included in the Geologic Report guidelines in Appendix 1 of this manual.

Soil Loss/Sediment Delivery Calculations

The civil engineer must evaluate pre-development and post development conditions for each block proposing tree removal to demonstrate no net increase in erosion from pre-development conditions. Such evaluation must demonstrate the soil loss ratio between pre- and post-development and must be included as part of the engineered plan, depending on the existing slope of the area.

Pre- and post-development soil loss shall be calculated using the Universal Soil Loss Equation (USLE) or the Revised Universal Soil Loss Equation (RUSLE2) according to the existing slope of the area. USLE is to be used for existing slopes less than or equal to 25 percent, while RUSLE is to be used for existing slopes greater than 25 percent and less than 50 percent. Per Section 36.22.020.A of VESCO, new vineyard and orchard development shall be prohibited on existing slopes greater than 50 percent.

Alternatively, the applicant may use another published or peer reviewed soil loss predictive model to show no net increase in erosion from pre-development conditions or may prepare a sediment delivery analysis using a published or peer-reviewed method consistent with the standard of care that demonstrates that the project will not result in a net increase in sediment delivery to streams, lakes or wetlands. Projects not using a sediment delivery analysis require a soil loss ratio of 1 or less.

The USLE and RUSLE2 soil loss equations are based on the following formula:

A = R x K x LS x C x P, where

A = average annual soil loss (tons per acre);
R = rainfall erosivity factor;
K = soil erodibility value;
LS = topographic factor (L=slope length, S=slope);
C = vegetation factor (type/height of canopy and percent canopy/ground cover); and
P = erosion control practice factor.

Divide the development area into blocks with similar landforms and slopes, generally no more than 20 acres in size for purposes of calculating the soil loss ratio or performing a sediment delivery analysis. For example, use existing drainages, major slope breaks, and topographic divides as natural boundaries between blocks. Then calculate a soil loss factor for pre- and post-development conditions for each block using the topographic (LS), vegetation (C) factors, and erosion control practices factors as described below or using the RUSLE2 computer model that can be downloaded for free from the NRCS website: http://www.ars.usda.gov/Research/docs.htm?docid=6038.

Pre-Development Soil Loss Factor = LSi x Ci x Pi

This soil loss factor sets the target for the post-development permanent erosion control requirements. The following sections describe how to determine these values based on site characteristics. For the purposes of calculating the soil loss ratio, the factors of R and K are removed from the equation given the assumption that rainfall and soil type will be unchanged by site development.

- For projects with slopes less than or equal to 25 percent, find the LS_i factor on the Length of Slope (LS) Values table included in Appendix 6 of this manual.
- For projects with slopes greater than 25 percent, determine LS_i using RUSLE2.
- Vegetation Factor (C_i).
- For projects with slopes less than or equal to 25 percent, determine the C_i factor using the methods detailed in the General Requirements section of this chapter, above, coupled with the Vegetation Factor (C_i) table included in Appendix 6 of this manual.
- For projects with slopes greater than 25 percent, determine C_i using RUSLE2.
- Existing Erosion Control Practice Factor (P_i).
- If the site is being converted from an existing development use, determine the P_i factor using the Erosion Control Practice Factor (P) included in Appendix 6 of this manual.
- If the site is undeveloped, use a value of 1.

Post-Development Soil Loss Ration

The soil loss ratio sets the target for the post-development permanent erosion control requirements. The final soil loss ratio for a site must be less than or equal to 1, which means soil loss cannot be increased by site development. Through the judicious use of erosion control BMPs described in Chapter 5 of this manual, the predicted final post-development soil loss can be designed to be less than or equal to the pre-development predicted soil loss of the site.

Determine the Cf factor, and then calculate the Final Erosion Control Gap to determine the gap that a site designer needs to close in order to meet or exceed the pre-development soil loss conditions.

Vegetation Factor (C_f)

- For projects with slopes less than or equal to 25 percent, determine the Cf factor using the Vineyard Cover Factor (Cf) table included in Appendix 6 of this manual.
- For projects with slopes greater than 25 percent, determine Cf using RUSLE2.

Determining the Final Erosion Control Gap

- Divide the pre-development soil loss factor by the Cf value determined above.
- Through an iterative process, the BMPs will be selected which will result in Pf and LSf values that close the Final Erosion Control Gap.

Tree Removal Operations

All sites proposing tree removal must adhere to the following standards when carrying out tree removal operations. Tree removal is permitted only between April 1st and October 15th, however at all times, erosion control measures must be employed as required by Sections 36.20.130, 36.20.140, and 36.20.150 of VESCO and detailed in Chapter 5 of this manual.

All trees and vegetation to be preserved during construction must be protected and marked at a height visible to equipment operators. To the extent feasible, protect existing ground cover and surrounding vegetation to be preserved. Remove debris from tree removal operations from locations in which it could potentially enter watercourses. Debris from tree removal must not be staged in a setbacks or riparian areas.

Monitoring and Reporting

Annual site monitoring shall occur for a minimum of three years following the final inspection. The project owner shall inspect the site for significant erosion or instability prior to October 15th and monthly from October to May. Annual monitoring reports shall be prepared and submitted to the agricultural commissioner on June 30th of each monitoring year.

Report Requirements

General Requirements

Identical color photographic scenes shall be taken and submitted to the agricultural commissioner before development and each January from specific locations as identified in the project permit. County staff shall perform at least one on-site inspection at the end of the three-year monitoring period, and other inspections as necessary.

Year One Report Contents

The monitoring report for the first year after development and the final inspection having been completed shall include a pre-development site characterization, as well as results from the year of monitoring.

Years Two and Three Report Contents

Thereafter, annual reports shall include a summary of the year's monitoring results and a discussion of trends noted, or problems observed, as well as a description of any repairs that were made. The report must include a description of the monitoring methods, including data collection and analysis.

Compliance

Projects that already have an approved CEQA document that contains measures that reduce geologic hazards and water quality impacts to a level of insignificance shall be considered to be in compliance with the applicable requirements of VESCO and these best management practices.

Chapter 5: Project Construction

The BMPs presented in this chapter focus on limiting soil erosion and the discharge of sediment during the construction of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage projects. This includes the movement and/or disturbance of soil attributed to land clearing, vegetation removal, soil preparation, agricultural grading, construction or modification of vineyard or orchard infrastructure, layout of vineyard or orchard blocks and vine or tree rows, planting of grapevines or orchard trees, the construction of agricultural drainage systems and agricultural roads and avenues, and other similar work.

Table 5, below, lists the BMPs prescribed for each phase of project construction, depending on site conditions. The subsequent descriptions of each BMP provide detail on specific site conditions that warrant their use.

Table 5. BMPs for each phase of project construction.

Phase	**BMP**	
During the work	Scheduling Preservation of existing vegetation Waste management	Stabilized construction entrance Equipment staging
Qualifying event (prior to winterization)	Scheduling Waste management Stockpile management Straw mulch	Fiber rolls Straw bale barrier Check dams
Winterization	Straw mulch Cover crop Outlet protection	Hydraulic mulch Hydroseeding Filter strip

Non-Structural BMPs

Non-structural BMPs generally consist of processes, prohibitions, procedures, schedule of activities, etc., that prevent pollutants from entering stormwater. They are generally low cost and low technology in nature. Non-structural BMPs described in the following section include:

- Scheduling
- Winterization
- Preservation of existing vegetation
- Waste management
- Stockpile management
- Stabilized construction entrance
- Equipment staging

Scheduling

Proper sequencing of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage activities shall be incorporated into the schedule of every project to reduce the potential for stormwater to contact disturbed soil, therefore limiting the potential for erosion.

Prior to winterizing the site in accordance with the following section, this includes daily monitoring of the weather forecast for a chance of rainfall and being prepared to deploy the prescribed BMPs should a qualifying rain event be predicted. As defined in VESCO, a qualifying rain event is *any weather pattern that is forecasted by the National Weather Service to have a 50 percent or greater chance of producing 0.5 inches or more precipitation on a site within a 48 hour or greater period between rain events.*

In addition, activities shall be planned and scheduled in accordance with the rainy season requirements detailed in Section 36.20.140 of VESCO.

Winterization

In accordance with Section 36.20.150 of VESCO, all sites must be adequately winterized by the winterization deadline shown in Table 36-9 of VESCO, as follows, until such time as all work has been completed.

- Cover crops established on all disturbed surfaces to 85% coverage; or
- Cover crops planted and straw mulch applied at a rate of 2 tons per acre on all disturbed surfaces.

Once a site has been winterized, work during the rainy season is limited in accordance with Section 36.20.140 of VESCO.

Preservation of Existing Vegetation

Preservation of existing vegetation involves the identification and protection of existing vegetation to be preserved. Per section 36.20.060 of VESCO, the limits of the development area shall be clearly identified and delineated on the approved plans and specifications, as well as defined and clearly marked at the site prior to beginning any construction activities. Vegetation located in any area outside the development area must be preserved and undisturbed. Within the limits of work-related ground disturbance, any trees and vegetation to be preserved must be identified and protected from damage by marking, fencing, or other measures

Waste Management

Per section 36.20.130 of VESCO, soil and other pollutant discharges shall be prevented or controlled. This includes implementing BMPs to limit or reduce the potential for pollutants due to solid and sanitary wastes to come into contact with stormwater.

Solid Wastes

Among other sources, solid wastes may be generated by trees and shrubs removed during land clearing, packaging materials, domestic wastes from meals, and plant containers during planting. Designate waste collection areas onsite and cover waste bins when not in use and prior to any storm event.

Sanitary Wastes

In the event that temporary or portable sanitary and septic waste systems are utilized during the implementation of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage, the following practices shall be followed:

- Locate facilities on level ground away from drainage facilities and streams;
- Equip facilities with containment to prevent the discharge of pollutants; and
- Arrange for regular service and disposal, to be completed in accordance with state and local requirements.

Stockpile Management

Stockpile management shall be incorporated into all projects that stockpile soil and other loose materials on-site. As loose materials can be transported not only by stormwater, but by wind as well, stockpile management shall be a year-round practice. Stockpile management includes a cover, as well as temporary linear sediment barrier.

During the rainy season and extended periods of inactive construction, stockpiles are to be covered and enclosed with a linear sediment barrier. Uncovered stockpiles during the non-rainy season should be sprayed with water and/or dust-suppressant, as necessary, to control dust emissions.

Stabilized Construction Entrance

A stabilized construction entrance is needed at all sites to reduce off-site tracking of mud and dirt by vehicles utilized on-site. To implement a stabilized construction entrance, complete the following:

- Define a singular point of entrance/exit on level ground, where possible;
- Place 3 to 6-inch diameter stones to a depth of 12 inches, or as recommended by a civil engineer, and a minimum width of 10 feet;
- Install rumble racks in the entrance, as needed, to help remove additional sediment; and
- Remove built-up aggregate from entrance, as needed prior to and following storm events.

Equipment Staging

When storing equipment on-site, locate away from drainage facilities and streams and on level ground, if possible. Place secondary containment beneath equipment to prevent the potential discharge of pollutants.

Erosion Control BMPs

Erosion Control BMPs are designed primarily to *prevent* soil and other pollutant discharges; whereas those mainly designed to *control* soil and other pollutant discharges are Sediment Control BMPs. The incorporation of both Erosion and Sediment Control BMPs throughout the construction of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage will limit the discharge of soil and other pollutants post-development.

Erosion control is any practice that protects the soil surface and prevents the movement of soil particles. Effective erosion control practices for new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage work include those that limit any impacts during the rainy season and those that maintain cover on the soil[3]. It is not possible to completely prevent all erosion, but erosion can be controlled and reduced to manageable rates through the careful selection, utilization, monitoring and maintenance of BMPs.

Erosion control best management practices presented in this chapter include the following:

- Cover Crops
- Straw Mulch
- Erosion Control Products
- Hydraulic Mulch
- Hydroseed

Cover Crop

Planting a cover crop is a cost effective and simple method to limit soil and other pollutant discharges. In addition to their ability to help prevent the potential for erosion, cover crops can: improve soil health, diversity, and soil organisms; control weeds; enhance nutrient and moisture availability; increase soil carbon; and control pests.

[3] U.S. Environmental Protection Agency (EPA). 2015. https://www.epa.gov/sites/production/files/2015-10/documents/chap4c.pdf.

Coverage

An established cover crop is an evenly distributed vegetative cover without bare soil areas that provides self-sustaining, native vegetation that is expected to provide substantial cover prior to the rainy season.

During development, a cover crop must be established to 85% coverage on all disturbed surfaces by the winterization deadline specified in Table 36-9 of VESCO. In order to ensure 85% coverage has been established by the specified date, cover crop seed must be broadcast by mid-September and irrigation applied as necessary. If the cover crop cannot achieve 85% coverage by the winterization deadline, straw mulch must be applied over the seeds at a rate of 2 tons per acre. As strip spraying of the cover crop often occurs during the rainy season, leave adequate cover crop to function as erosion control.

Types of Cover Crops

Types of cover crops including perennial, annual, fast growing, slow growing, overstory, understory, grasses, and forbs, all of which have the potential to provide a variety of benefits. The ideal mix for a site depends on current and future preferred conditions. When selecting a cover crop mix, select a mix that has both tall, fast growing plants (such as rye, grass, or barley) for overstory protection and leafy, low growing plants (such as clover) for understory protection. The combination of both tall and low plant varieties better protects the soil from rain and erosion. Examples of cover crop seed mixes are shown below. For additional information, watch *Discover the Cover* at www.youtube.com/watch?v=VHMCJSxQAgo.

Examples of cover crop seed mixes are detailed below:

Hillside – Shallow Soils (Erosion Control)	
"Zorro" annual fescue	40%
"Blando" brome	27%
"Hykon" rose clover	23%
Seeding rate:	25 lbs per acre

Hillside Quick Erosion Control (Soil Builder)	
Red oats	65%
Crimson clover	13%
Austrian winter pea	22%
Seeding rate:	90 lbs per acre

Hillside Soils (Frequent Moving)	
"Zorro" annual fescue	40%
Subterranean clover	35%
"Hykon" rose clover	25%
Seeding rate:	30 lbs per acre

Vineyard Terrace (Slope Stabilizer)	
"Blando" brome	45%
"Molate" red fescue	55%
Seeding rate:	25 lbs per acre

Quick Erosion Control (Cold Soils)	
Cereal rye	83%
Crimson clover	17%
Seeding rate:	90 lbs per acre

Native, No-Till Blend (Mature Vineyards)	
California meadow barley	36%
"Molate" red fescue	38%
California brome	26%
Seeding rate:	39 lbs per acre

Straw Mulch

Mulch is a low-cost and effective erosion control measure that is used to protect exposed soil from the elements when stabilization has not been achieved by other means. While various mulch products are available, straw mulch is the most common mulch and is often used in conjunction with freshly-spread cover crop seed to help protect the seeds until they can become established.

Installation and Maintenance

Straw mulch can be applied by hand or using commercial blowers, depending on the type of application needed. To be effective, straw must be applied at the rate of 2 tons per acre (approximately 42 bales per acre) and should cover the entire seeded or exposed area, leaving no exposed soil.

To prevent newly spread straw from blowing away in areas with strong winds, the straw must be anchored to the ground by matting, crimping, or other methods. Compounds such as organic tackifiers can also help to reduce this by increasing the stickiness of loose straw.

Geotextiles and Mats

Erosion control products, including geotextiles, mats, and erosion control blankets, are used to cover and stabilize exposed surfaces from erosion, hold soil in place, and absorb and hold moisture near the soil surface. They vary in material, price, and suitability, but are generally biodegradable products that are anchored to the soil with metal staples or wooden stakes. In the context of this manual, use only biodegradable products.

Erosion control products are most effective in the following locations:

- Steep slopes and disturbed areas where mulch anchoring would be needed;
- Disturbed areas where vegetation establishes slowly; and
- Constructed swales or drainage ditches where vegetation is difficult to establish.

They are not suitable for rocky sites or in areas such as vineyard avenues where final vegetation will be mowed.

Installation and Maintenance

Erosion control products are most effective when the site is properly prepared prior to their installation. Remove all rocks, vegetation, and other obstructions to allow the installed product direct contact with the soil. In addition, seed the area before installation to encourage revegetation and long-term stability.

Sediment Control BMPs

Sedimentation is the process of soil and rock detachment (erosion), transport, and deposition. Sediment Control practices slow the velocity of water, control the direction and distance it travels through the site, and filter, trap, or settle soil particles[4]. The following BMPs are designed to prevent soil particles from leaving the site by directing runoff to trap loose soil particles and promoting the infiltration of sheet flow:

- Fiber Rolls/Straw Wattles
- Straw Bale Barrier
- Filter Strip
- Check Dams

[4] U.S. Environmental Protection Agency (EPA). 2015. https://www.epa.gov/sites/production/files/2015-10/documents/chap4c.pdf.

Fiber Rolls/Straw Wattles

Fiber rolls or straw wattles are wood excelsior or coconut fibers rolled or bound into a tight tubular roll and are to be used to stabilize the site during winterization and post-development to reduce stormwater flow velocities, intercept runoff, and filter and trap sediment. While various types of fiber rolls exist, those made of biodegradable filler and netting materials are to be used for agricultural development.

Fiber rolls should not be placed in areas of concentrated flow, such as across constructed swales or drainage ditches with more than 2 acres of contributing drainage area.

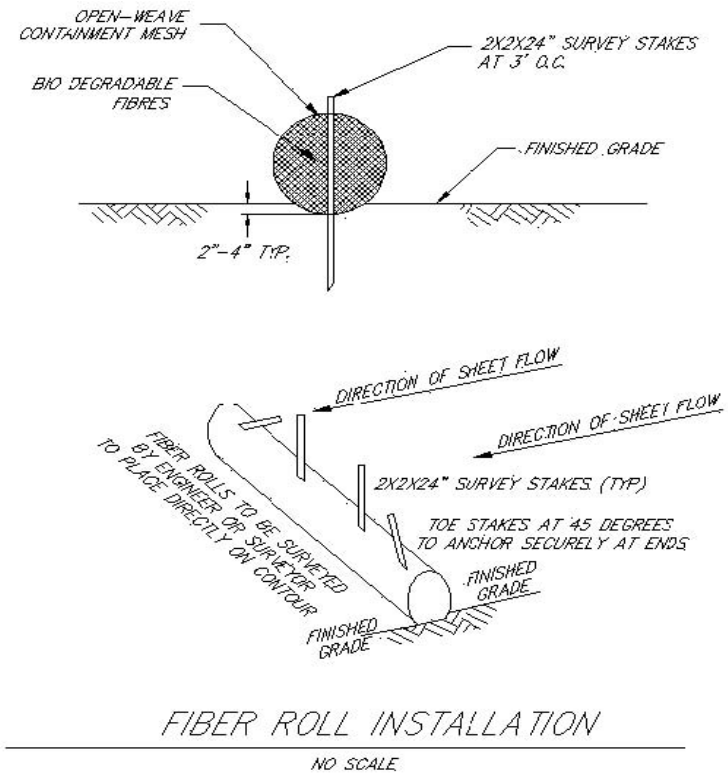
Installation and Maintenance

Fiber rolls are designed to be installed along the contour on all slopes 10% or greater, in areas of slow surface flows. A general rule of thumb for vertical spacing is:

- 10% – 20% slopes = 60 feet apart;
- 20% – 50% slopes = 30 feet apart;
- Greater than 50% slopes = 10 feet apart; or
- As the project engineer dictates.

Fiber rolls are installed in a shallow trench forming a continuous barrier along the contour in a shallow depression (about 3 to 5 inches deep). Stake fiber rolls into place using a 1” x 2” x 24” or 2” x 2” x 24” wooden stake. Once in place, secure the fiber roll with foot-tamped backfill on the uphill side to prevent water from undercutting it. Overlap ends horizontally by 6 inches and toe stakes at 45-degree angles to anchor the ends.

Fiber Roll Installation



FIBER ROLL INSTALLATION

NO SCALE

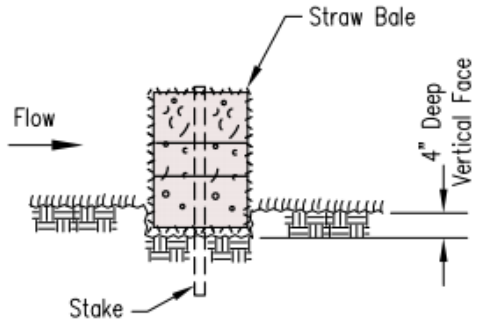
Straw Bale Barrier

Straw bale barriers are used as sediment traps and check dams that function, in part, by detaining sediment-laden runoff long enough for sediment to deposit behind the bales. They are primarily used to control and filter stormwater flows in areas with low velocities and should never be used in streams or high flow areas.

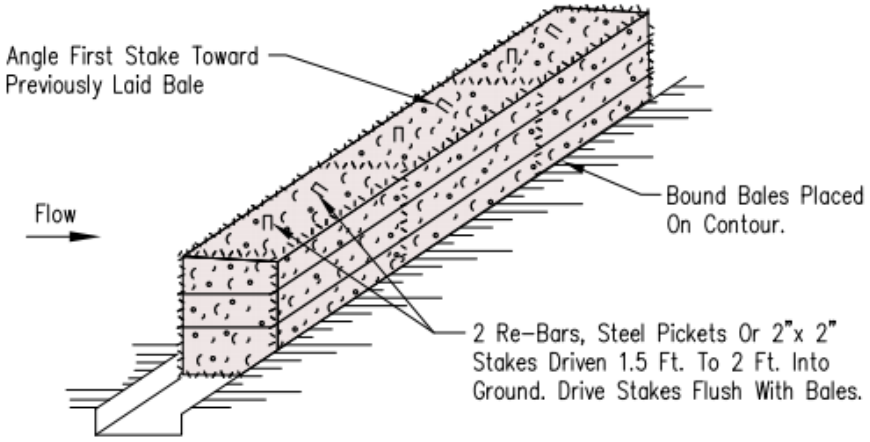
Installation and Maintenance

Install straw bale barriers along the contour, by placing bales in a row with ends tightly abutting adjacent bales. Embed each bale in the soil at least 4 inches and once set, drive stakes or rebar through the bales and into the ground 1.5 to 2 feet for anchorage. See images below for a detailed depiction of proper installation. When placed in a constructed swale or drainage ditch, install straw bales in a channel-like configuration that will direct the flows to a single low point.

Straw Bale Barrier



BEDDING DETAIL



ANCHORING DETAIL

Filter Strip

A filter strip is a gently sloping vegetated strip of land or area established to remove sediment and other pollutants from runoff and encourage stormwater infiltration. It is an effective method to trap sediment before it is delivered into environmentally sensitive areas such as streams and other water bodies.

Installation and Maintenance

Install filter strips on the approximate contour downslope of disturbed areas and where sheet flow has been reduced to non-erosive levels. Filter strips are most effective on slopes of 5% or less, are maintained at 85% vegetative cover and are 25' to 50' wide.

Many of the plant species used for cover crops, such as low growing, perennial grasses, can be utilized for filter strips as well. As with cover crops, described above, plant seeds uniformly over the area designated for the filter strip and fully cover newly seeded areas with mulch to facilitate vegetation establishment.

After establishment, maintain 85% vegetative cover by mowing and reseeding when necessary. Restore or replant the filter strip if it accumulates so much sediment that it no longer functions effectively.

Yearly replanting and maintenance will be required to ensure the health and function of the filter strip, especially if development plans utilize the strip as a vegetated avenue.

Check Dams

Check dams are small barriers composed of rock, gravel bags, sandbags, or fiber rolls placed across a swale or drainage ditch to reduce the effective slope of the channel and flow velocity. They also help to remove sediment from runoff by detaining sediment-laden runoff long enough for sediment to deposit behind the check dams. They should be limited to channels that drain 10 acres or less.

Installation and Maintenance

Evenly space check dams in the channel in which they are placed. They are not to be used in channels that are grass-lined, unless sediment-laden flows or flows with erosive velocities are anticipated.

Appendix 1: Guidelines for Preparing Geologic Reports

Purpose

To specify general guidelines for professional geologists to prepare geologic reports for the following:

- New vineyard and orchard development and vineyard and orchard replanting in any setback from areas of slope instability prescribed in Section 36.20.080 of VESCO and listed in Table 6, below;
- New vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage proposed across repaired areas of slope instability;
- Level II new development projects proposing tree removal, to identify and characterize potential areas of instability;
- Level II new development projects proposing tree removal in areas of mapped potentially non-cohesive soils, with existing slopes steeper than 25 percent; and
- To generally inform designers about geologic hazards that may be affected by proposed new vineyard and orchard development and vineyard and orchard replanting.

A geologic report is valid for three years from the date of the report. Reports older than three years will require an update from a professional geologist and address any changed conditions on the site.

A geologic report prepared under these guidelines is a written document prepared by a professional geologist that presents the application of scientific knowledge, principles, and methods to geological problems by investigating, measuring, interpreting and reporting on the physical phenomena of the earth. These guidelines present standards for preparing a geologic report to be utilized in the planning, design, construction, and maintenance of new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage. The following sections describe the procedures for properly evaluating the geology of the site in relation to the planned development and the content that must be included in a geologic report.

Geologic Report Methods

A geologic report shall characterize the areas of instability, surficial soils, and subsurface geology and evaluate local geology and geomorphology relative to the planned development in accordance with the following methods.

Assessment Area

The assessment area shall be large enough to fully characterize the site and include:

- All areas of slope instability within or near the development area;
- Limits of the development area;
- Agricultural road network; and
- Areas of proposed grading and drainage improvements; and
- Any other area that may be part of or may be affected by the planned development.

Background Data Review

At a minimum, the following sources shall be consulted during the background data review and presented and properly cited in the report:

- Relevant public domain geologic reports;
- Most recent topography using USGS 7.5-minute topographic or a site-specific topographic survey, if available;
- Sonoma County LIDAR data set;
- Current geologic maps; and
- Current and historic aerial imagery.

Field Work Methodology

Field work shall be conducted to identify and/or confirm identified areas of instability and potential non-cohesive soils, characterize the surficial soils, subsurface geology, and geomorphic features. The proper field work methodology to sufficiently characterize the site may be determined at the discretion of the professional geologist completing the report.

Field Work for Non-Cohesive Soils (Tree Removal Projects Only)

For sites with existing slopes greater than 25 percent in mapped areas of potentially non-cohesive soils, the professional geologist shall review the site for non-cohesive soils. A non-cohesive soil, as defined by VESCO, is a soil where the particle size of the smaller than 2mm fraction of the soil is coarser than loam as defined by the Natural Resources Conservation Service (NRCS) soil texture classification scheme. A list of potentially non-cohesive soils in Sonoma County is included following the References section of these guidelines.

The preferred approach to characterize a site with potentially non-cohesive soils is to divide the site into blocks generally no more than 20 acres in size, based on existing natural features, such as drainage courses, major slope breaks, and topographic divides and make observations based on each of the blocks.

Lab Testing for Non-Cohesive Soils

For sites with existing slopes between 25 and 40 percent in areas of non-cohesive soils identified by the geologic report, a slope stability analysis shall be conducted. Tree removal shall be prohibited when the factor of safety (static) is less than 1.5 under saturated conditions after tree removal. Development is prohibited in areas of non-cohesive soils with slopes greater than 40 percent.

Geologic Report Contents

A geologic report shall contain the following sections, at a minimum. Additional sections may be included, as deemed necessary by the professional geologist completing the report.

Cover Page

Each report shall provide a cover page, which shall include the following:

- Project Name;
- Applicant name and contact information;
- Property Owner, if different from applicant;
- Physical address of the property, if applicable;
- Assessor's Parcel Number (APN);
- Name and qualifications of professional completing report; and
- Date of report.

General Information

Each report shall provide a general site description, which shall include the following:

- Description of site conditions, including location, elevation, site dimensions, slopes;
- Proposed development, including grading and drainage;
- Description of the general assessment area and its setting with respect to major geographic and geologic features;
- Topography and drainage in the area; and
- Abundance, distribution, and general nature of exposures of earth materials within the area.

Field Work Description

The report shall include the following details regarding the completed field work, as applicable:

- Date field work completed;
- Name of the individual responsible for geologic mapping;
- Detailed description of the field methodology used;
- Description of how the slope stability was characterized and mapped for each feature;
- Description of laboratory testing completed to characterize soils; and
- A complete record of all field observations and laboratory tests.

Geologic Descriptions

Each geologic report shall contain a complete and accurate description of all geologic conditions listed below recognized or inferred within the assessment area. Where interpretations are added to the recording of direct observations, the bases for such interpretations must be clearly stated.

- Soil type, as defined in the NRCS Soil Survey of Sonoma County;
- Bedrock geology, including:
  - Formation names and ages;
  - Lithology (rock types);
  - Distribution and dimensions of any exposures (for example: thickness, outcrop, breadth, vertical extent); and
  - Any features in response to natural surface and near-surface processes.
- Geomorphology, including:
  - Landslides;
  - Landscape geomorphology indicative of potentially unstable slopes;
    - Inner gorges;
    - Debris slide slopes;
    - Hummocky areas;
    - Closed depressions;
    - Disorganized drainages;
    - Disrupted linear features such as fences or roads;
    - Benches of questionable origin;
    - Tension cracks;
    - Leaning trees; or
    - Seepage sites.
- Subsurface geology;
- Drainage (surface water and groundwater), including its relation to topography and geologic features; and
- Geologic features of special significance not already included in the previous descriptions, including:
  - Features representing accelerated erosion (cliff reentrants, badlands, advancing gully heads);
  - Features indicating subsidence of settlement (fissures, scarplets, offset reference features, historic records and measurement);
  - Features indicating creep (fissures, scarplets, distinctive patterns of cracks and/or vegetation, topographic bulges, displaced or tilted reference features, historic records and measurements); and
  - Slump and slide masses in bedrock and/or surficial deposits.

Consideration of Geology in Recommendations

Geologic evaluations performed in accordance with the guidelines presented herein must consider topography, soil classification, geomorphology, geologic structure, slope gradient/orientation, planned vine row orientation, planned drainage systems, sheet flow drainage, and proposed setbacks from areas of slope instability if different from those required by VESCO, and listed in Table 6, below.

Table 6. Area of slope instability setback requirements (setback requirements from Table 36-4 in Section 36.20.080 of VESCO).

Location	**Setback for Development Areas for New Vineyard and Orchard Development**	**Setback for Deep Ripping for Vineyard and Orchard Replanting**
Below and lateral to area of slope instability	50 feet from the mapped boundary, unless a geologic report recommends a lesser or greater setback	50 feet from the mapped boundary, unless a geologic report recommends a lesser or greater setback
Above area of slope instability	100 feet from the mapped boundary, unless a geologic report recommends a lesser or greater setback	100 feet from the mapped boundary, unless a geologic report recommends a lesser or greater setback

Table 7. Geologic reporting requirements for specific scenarios.

Scenario	**Geologic Requirement**
Single or multiple areas of instability with boundaries clearly observed and developer agrees to set back in accordance with Table 1 above	No Geologic report required
Single or multiple areas of instability with boundaries clearly observed and developer would like to plant within setbacks outlined in Table 1 above	Geologic report required
Single or multiple areas of instability with boundaries difficult to discern and developer agrees to set back in accordance with Table 1 above	Map of unstable features created by professional geologist/ no geologic report required
Single or multiple areas of instability with boundaries difficult to discern and developer agrees to set back in accordance with Table 1 above	Geologic report required

Recommendations

Recommendations shall be based on a well-reasoned **analysis** of the planned development in relation to all geologic observations. Slope instability setbacks shall be based on their potential for adverse impacts to slope stability, mass wasting, and erosion.

Maps

All mapping shall be completed using a detailed topographic map, with the basis of the map indicated. Mapping shall consider the lithology, structural elements, and three-dimensional distribution of the earth materials exposed or inferred within the assessment area. All maps must use the most recent imagery available and include project name, north arrow, bar scale and text scale, date and source of imagery, and current date.

The following maps should be included as part of a complete assessment:

- Location map showing the physical address of the property;
- Site Development map, including planned development, with areas of instability and any other pertinent geologic features identified; and
- Topographic, hillshade, or aerial photo map(s) showing setback areas where development is precluded, all areas of identified slope instability, test pit locations, and a clearly defined assessment area.

References

Provide a reference for all documents and resources used and list of persons consulted, including dates of access for online records and of conversation for personal consultation.

Potentially Non-Cohesive Soils

Abbreviations of the NRCS soil series for Sonoma County.

101m	AgD	HgG2	SrG
105em	AgE	HhF	StE
109m	AkB	HkF	StE2
110em	AkC	HkG	StF
114n	BoE	HhF	SuF
116em	BoF	HkF	SuG
134I	BoG	HkG	TuC
135I	CgC	HkG2	TuE
135wm	CgD	HIF	YwF
137wm	CgE	HIG	YwG
148I	ChA	HmF	ZaA
149em	CmE	HmG	ZaB
152em	CmF	HnE	
157em	CmG	HnG	
158em	CpG	HnG2	
160em	CrA	HoG	
162em	CsA	HrG	
168n	DuE	HsF	
169I	FaD	HsG	
169wm	FaE	LkG	
170I	FaF	LmG	
171wm	FaG	LnG	
178m	GgD	LuA	
179m	GgE	LvB	
180em	GgF	MbC	
184m	GgF2	McF	
185wm	GgG	MIG	
186I	GID	MoE	
191wm	GIE	MoG	
200I	GIF	PbB	
201em	GIF2	PeA	
202em	GIG	PeC	
205wm	GoF	PgB	
211em	GrE	PhB	
224I	GrG	PkC	
225em	HaB	PIC	
226I	HbC	PID	
229I	HbD	PsC	
231wm	HbD2	PsD	
233em	HbE	RaC	
235em	HbC	RaD	
235wm	HcC	RaE	
237wm	HcD	RcD	
254I	HcD2	ReE	
AdA	HcE	RnA	
AeA	HcE2	SoF	
AgB	HgE	SoG	

Appendix 2: Guidelines for Preparing Soils Reports

Purpose

To specify general guidelines for soils engineers and geotechnical engineers to prepare soils reports in support of the following:

- Engineered agricultural grading, as defined by VESCO;
- A slope greater than 2 feet horizontal to 1 foot vertical (50 percent) for cut and fill surfaces, in accordance with Sections 36.20.020.B.1. and 36.20.020.C.7 of VESCO, respectively;
- To justify terracing and drainage of cuts and fills with surface slopes greater than 3 feet horizontal to 1 foot vertical (33 percent), as described in Section 36.20.020.D. of VESCO; or
- New vineyard and orchard development proposed on fill slopes supporting structures and surcharges, as required by Section 36.20.020.A. of VESCO.

A soils report prepared under these guidelines is a written document prepared by a soils engineer or geotechnical engineer, which presents the application of scientific knowledge, principles and methods to inform agricultural grading designed in accordance with Section 36.20.020 of VESCO and should be prepared with sufficient clarity to indicate the nature and extent of proposed grading improvements. Where geologic hazards have been identified within the area of proposed grading, the report must be prepared in consultation with a professional geologist. Where conflicts occur between the technical requirements of VESCO and the soils report, the recommendations presented in the soils report govern.

A soils report is valid for three years from the date of the report. Reports older than three years will require an update from the soils engineer or geotechnical engineer and address any changed conditions on the site.

Soils Report Methods

Assessment Area

The assessment area must be large enough to fully characterize all areas of proposed grading and include:

- The proposed development area;
- All areas of proposed grading; and
- Any other area that may be affected by the proposed grading.

Background Data Review

At a minimum, the following sources should be consulted during the background data review and presented in the report:

- Relevant geotechnical investigations obtained from published work or previous consultant reports;
- Most recent topography using USGS 7.5 minute topographic or a site-specific topographic survey, if available;
- Sonoma County LIDAR data set; and
- Current geologic maps.

Field Exploration Methodology

Field explorations shall be conducted to characterize the nature, distribution and strength of existing soils and if present, identify and/or confirm areas of instability. Geotechnical explorations may include borings, test pits, and trenches, however the proper field exploration methodology may be chosen at the discretion of the civil engineer completing the report.

Laboratory Testing

Laboratory testing shall be performed to substantiate all findings, conclusions, and recommendations. Laboratory testing procedures shall be described in detail, with relevant references to ASTM testing standards. Soils reports shall present results in well-organized tables and graphical laboratory test sheets.

Soils Report Contents

Soils reports must include information regarding the nature, distribution and strength of existing soils, conclusions and recommendations for grading procedures and design criteria. Geologic conditions on the site must be fully characterized based on field data and laboratory testing.

A soils report shall contain the following sections, at a minimum. Additional sections may be included, as deemed necessary by the soils engineer or geotechnical engineer preparing the report. In addition to the sections outlined below, when geologic hazards have been identified within the area of proposed grading, the report must contain a section prepared by a professional geologist that includes an adequate description of the geology of the site and conclusions and recommendations regarding the effect of geologic conditions on the proposed work.

Cover Page

Each report shall provide a cover page, which shall include the following:

- Project name;
- Applicant name and contact information;
- Property owner, if different from applicant;
- Physical address of the property, if applicable;
- Assessor's Parcel Number (APN);
- Name and qualifications of professional preparing report; and
- Date of report.

General Site Information

Each report shall provide a general site description based, in part, on the field data and laboratory testing, and shall include detailed descriptions of the following:

- Existing site conditions including location, elevation, site dimensions, slopes, topography, and drainage;
- Proposed development, including drainage improvements;
- Geologic setting relative to major geographic and geologic features;
- Engineering properties and distribution of geologic units identified on the site, if any;
- Subsurface geologic structure; and
- Groundwater, including current and historic high groundwater levels, and geologic structures that may influence groundwater movements.

Documentation of Field Exploration

Each soils report shall contain a complete description of the field exploration, including:

- Type and number of field explorations.
- Date field work completed and name of individual responsible for field work.
- Detailed description of the field methodology used, with clear discussions and complete, graphic logs of excavations. Methods of excavation, and the methods and type(s) of sampling should be clearly defined and discussed.
- Extent and content of any laboratory testing.
- Calculations and analyses performed.
- A complete record of all field observations and laboratory tests shall be included within the final report.

Engineering Analysis

Engineering analyses should be based on substantiated geotechnical data and should provide the basis for the conclusions and recommendations of the soils report. Engineering analyses performed using computer programs shall include reference information regarding the software used and include printouts of applicable input and output files.

Conclusions and Recommendations

Conclusions and recommendations shall be directly related to one of following the proposed agricultural grading activities requiring the soils report:

- Engineered agricultural grading, as defined by VESCO;
- Cuts and fills with a surface slope greater than 2 feet horizontal to 1 foot vertical (50 percent), in accordance with Sections 36.20.020.B.1 and 36.20.020.C.7 of VESCO, respectively;
- Terracing and drainage of cuts and fills with surface slopes greater than 3 feet horizontal to 1 foot vertical (33 percent), as described in Section 36.20.020.D. of VESCO; or
- New vineyard and orchard development proposed on fill slopes supporting structures and surcharges, as required by Section 36.20.020.A of VESCO.

Recommendations for proposed agricultural grading must be based on a thorough analysis of the planned development based on the technical findings. Findings, conclusions and recommendations shall be substantiated using site-specific field and/or laboratory data and appropriate analyses. Where professional judgment is utilized to augment the data and analyses, a technical rationale shall be clearly discussed.

Maps

All mapping shall be completed using a detailed topographic map, with the basis of the map indicated. All maps must use the most recent imagery available and include project name, north arrow, bar scale and text scale, date and source of imagery, and current date.

The following maps shall be included as part of a complete assessment:

- Location map showing the physical address of the property.
- Site Development map, including planned new planting and/or replanting areas, access roads, vehicle turnaround, and all other development features, with areas of proposed grading identified.
- Site Geotechnical map, including locations of the proposed grading, all exploratory borings and trenches/test pits, geologic cross-sections, and plotted geologic data from all subsurface excavations.

References

Provide a reference for all documents and resources used and list of persons consulted.

Plan Review and Inspection Responsibilities

The soils engineer or geotechnical engineer responsible for the soils report must provide a letter indicating the plans were prepared in accordance with the recommendations contained in his/her report and must also provide a letter verifying that his/her firm has been employed by the applicant and agrees to provide inspection, furnish as-built grading plans, and submit final approval of the agricultural grading in accordance with VESCO.

The civil engineer shall inspect the agricultural grading work at the various stages of the work requiring approvals and more frequently if he/she deems necessary, including preparation of the ground to receive fills and compaction testing, and shall verify the stability of all finish slopes and the design of buttress fills, where required.

Appendix 3: Guidelines for Preparing Drainage Reports

Purpose

To specify general guidelines for civil engineers to prepare drainage reports for new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage projects involving existing and/or proposed drainage systems including:

- Constructed drainage systems; and/or
- Overland sheet flow.

A drainage report prepared under these guidelines is a written document prepared by a civil engineer that presents the application of scientific knowledge, principles and methods to evaluate existing and/or design proposed, drainage facilities and systems. The report should be prepared with sufficient clarity to provide a comprehensive evaluation of existing drainage facilities and systems and/or indicate the nature and extent of proposed drainage alteration(s), which by definition is the construction or modification of any drainage facility or system. Drainage facilities and systems are to be designed in accordance with Section 36.20.030 of VESCO and Chapter 2 of this manual in order to maintain natural and existing drainage patterns, maximize infiltration, and limit runoff and erosion. These guidelines present standards for preparing drainage reports to be utilized in the planning, design, construction, and maintenance of vineyard and orchard development and agricultural grading and drainage projects.

Drainage Report Contents

Cover Page

A drainage report shall contain a cover page that contains the following information:

- Name of project and site address;
- Assessor's Parcel Number(s);
- Property owner name and contact information;
- Report preparer name and contact information;
- Seal and signature of civil engineer; and
- Date prepared.

Project Narrative

A drainage report shall provide a general site description, which shall include the following:

- Description of site conditions including: location, elevation, site dimensions, and slopes;
- Methodologies used to prepare drainage report and analysis;
- Assumptions pertinent to drainage design;
- Disclosure of existing on-site and off-site drainage conditions;
- Proposed development, including grading;
- Impacts of proposed drainage design; and
- Topography and drainage in the area.

Hydrology and Hydraulic Calculations – Constructed Drainage Facilities

Drainage reports prepared for both existing and/or proposed drainage facilities and systems must present an analysis of pre- and post-development hydrology for all pertinent drainage areas, beginning from the top of the watershed.

Drainage reports prepared for proposed constructed drainage facilities must present the location, length, width, direction, and quantity of flow for each drainage facility and an analysis of the following:

- Hydraulic calculations for both **proposed** and **existing** (where affected by the drainage design) drainage facilities and systems such as swales, culverts, inlets, v-ditches, storm drains, and outlets such as sediment basins and velocity dissipation devices;
- Hydraulic calculations for swales, inlets, v-ditches, storm drains, and outlets must clearly demonstrate that the proposed drainage facility has been adequately sized to convey stormwater flows from the proposed project for no less than the 25-year design discharge, whereas stream crossings must be designed for the 100-year design discharge; and
- Hydraulic Grade Line (HGL) calculations for storm drain pipe network systems where needed, with an explanation of the established or determined starting HGL.

Hydrology and Hydraulic Calculations – Sheet Flow

Drainage reports prepared for projects involving sheet flow must analyze the following:

- Length and time of concentration of sheet flow to determine the point at which sheet flow becomes concentrated;
- Beginning at the point at which sheet flow becomes shallow concentrated flow, provide engineering justification that the predicted concentrated flows are non-erosive; and
- If it is determined the predicted shallow concentrated flows are erosive, propose drainage facilities to control flows in accordance with the BMPs presented in Chapter 2 of this manual.

The length of time of concentration of sheet flow may be analyzed in accordance with the following method or by an alternative published and peer reviewed method. The following method is not intended to produce a rigid or required solution to determining sheet flow characteristics, but rather is intended to assist designers in determining when a limit of sheet flow, and thereby the beginning of shallow concentrated flow, may occur. While these equations provide a method for assessing length and time of concentration of sheet flow, project design must additionally consider onsite soil characteristics, including soil erodibility. The analysis must consider flow paths for sheet flow that analyze worst cases conditions.

Using a hydrology map prepared under these guidelines, measure proposed sheet flow lengths and slope gradient within each hydrologic unit from the top of the watershed to the down slope location where concentrated flow is predicted. Analyze hydrologic conditions using the following method based on findings from the "Assessment of Kinematic Wave Time of Concentration" by McCuen and Spiess (1995). Through analytical means and correlation to field data, McCuen and Spiess developed the following limit relationship for use by designers to improve the determination of sheet flow length, and thereby the resulting time of concentration of the sheet flow regime.

$$\frac{nL}{\sqrt{s}} \leq 100 \text{ , where}$$

n = Manning's n

L = sheet flow length (foot)

s = slope (foot/foot)

Table 8: Manning's n values for sheet flow.

Surface Description		n
Smooth surface		0.011
Fallow (no residue)		0.05
Cultivated soils	Residue cover <20%	0.06
	Residue cover >20%	0.17
	Short grass prairie	0.15
Grasses	Dense grasses	0.24
	Bermuda grass	0.41
Range (natural)		0.13
Woods	Light underbrush	0.40
	Dense underbrush	0.80

*Table adapted from USDA Technical Release 55 (USDA, 1986)

Where this ratio conforms to the above limit, the following kinematic wave equation for time of concentration (Tc) may be used:

$$Tc = \frac{0.93}{i^{0.4}} \left(\frac{nL}{\sqrt{s}}\right)^{0.6} \text{ , where}$$

i = rainfall intensity (inch/hour)

This equation requires an iterative solution. An estimated time of concentration (denoted as tc) would be selected for the watershed in question. The IDF curve for the watershed would be entered with the estimated tc, and desired return period, and resulting rainfall intensity ( ) taken from the IDF curve and entered into the above equation. When the calculated Tc is equal to the estimated tc (Tc tc), the iteration has converged to a solution. The IDF curve prepared by the Sonoma County Water Agency (SCWA) is included below.

Beginning from the point at which it is determined that shallow concentrated flow begins, the equations presented above are no longer applicable and the designer must perform hydrologic analysis consistent with the Drainage Report requirements for Constructed Drainage Facilities in Section 36.20.030 of VESCO and local engineering practice. If it is found that the shallow concentrated flows may be erosive, the flows must be diverted using a conveyance facility discussed in Chapter 2 of this manual.

Hydrology Maps

A hydrology map prepared by a civil engineer shall accompany the drainage report and shall be:

- A full size sheet no greater than 24" x 36"; and
- Drawn to an engineering scale no less than 1" = 100'.

A hydrology map shall show the location of all areas subject to stormwater runoff to and from the site and adjacent areas and shall contain the following information:

- All items listed under the cover sheet requirements, above;
- North arrow and scale (written and graphic);
- Property lines, right-of-ways, and easements;
- Existing and proposed contours and elevations;
- Location and specifications (size, material, length, slope, condition, etc.) of existing and proposed drainage facilities and systems;
- Pre- and post-development drainage areas and points of concentration utilized in hydrology analysis;
- Sheet flow lengths and directions;
- Elevations for inverts, flowlines, top of grates, high points;
- Tributary areas beginning from the top of the watershed; and
- Horizontal and vertical locations of all improvements (include reference to control points).

Other Required Documentation

- Projects within the Flood Prone Urban Area shall include documentation demonstrating the proposed project will not adversely affect existing drainage.
- Projects within Special Flood Hazard Areas shall include documentation demonstrating the proposed project will not cause a reduction in flood carrying capacities (no net fill).
- Any other supporting or supplemental data, documentation or calculations relevant to the proposed project.

References

Provide a reference for all documents and resources used and a list of persons consulted.

Appendix 4: Guidelines for Preparing Biotic Resource Assessments and Focused Species Assessments

Purpose

To specify general guidelines for professional biologists to prepare the following:

- Biotic resource assessments for new vineyard and orchard development on uncultivated land.
- Focused species assessments for new vineyard and orchard development on cultivated land in designated critical habitat areas.
- Focused species assessments for standard vineyard and orchard replanting in designated critical habitat areas.

Procedure

Biotic resource and focused species assessments shall be prepared by qualified professional biologists using the biotic resource identification and mapping methods and reporting standards included in these guidelines. Biotic resource and focused species assessments shall identify any requirements or changes that must be incorporated into the design, layout, and/or construction of the proposed development. Biotic resource and focused species assessments are not environmental clearance documents for purposes of the California Environmental Quality Act.

Biotic resource and focused species assessments shall be submitted to the Department with the permit application. If a biotic resource or focused species assessment identifies potential wetland areas, a wetlands report must be included as an appendix to the assessment.

Biotic resource and focused species assessments shall be valid for three years from the date of the assessment. Biotic resource and focused species assessments older than three years must include an addendum from a professional biologist addressing any changed conditions in the study area or any newly listed species that may be present. If impacts to listed species are identified in a biotic resource or focused species assessment, the Department may forward the permit application to appropriate state and federal resource agencies.

Professional Biologists Qualified to Prepare

Professional biologists preparing biotic resource and focused species assessments shall complete a "Declaration" self-certifying that they have the qualifications and experience necessary to prepare biotic resource and focused species assessments (See Exhibit A – Professional Biologist Qualifications Declaration for Biotic Resource and Focused Species Assessments). The declaration must be signed and included in the assessment.

Methods

Biotic resource assessments shall use the approach outlined below to identify and evaluate biotic resources, listed species, and waterbodies present on a site. Focused species assessments shall use the approach outlined below to identify and evaluate critical habitat, listed species, and waterbodies present on a site.

Determine Study Area

The study area must be large enough to fully characterize all potential biotic resources, listed species, and waterbodies present, and include the following:

- The proposed development area.
- Any other areas that may be affected by the proposed development.
- A 100-foot buffer around those areas, if feasible.

Background Data Review

A review of relevant background data must be conducted for all biotic resource and focused species assessments. The following sources must be consulted during the background data review and presented and properly cited, as relevant, in the assessment:

- California Natural Diversity Database (CNDDB), ECOS, California Native Plant Society (CNPS), other reports, museum or herbarium records, etc.
- USGS 7.5 minute topographic map(s) or site-specific topographic survey, if available.
- Current site plan.
- Current general plan, local coastal program, and zoning code.
- Current Sonoma County vegetation map.[5]
- Current Sonoma County LIDAR data set.
- Current and historic aerial imagery, with dates referenced in the Assessment.
- Current U.S. Fish and Wildlife Service Information for Planning and Conservation (IPaC) and National Marine Fisheries Service (NMFS) species list for the study area.
- U.S. Fish and Wildlife Service, Santa Rosa Plain Conservation Strategy.
- Recovery Plans for listed species occurring in Sonoma County.

Field Survey

A field survey must be conducted for all biotic resource assessments and focused species assessments, unless the study area is well understood and justification is provided that the study area presents no issues with respect to listed species. Field surveys should be conducted in a manner that will locate the habitats of any listed species that may be present. It is the responsibility of the professional biologist to evaluate field conditions and determine the field work approach (Exhibit B – General Field Survey Protocol).

[5] http://www.sonomavegmap.org.

Determine Waterbody Setbacks

Lake, pond, reservoir, and stream setbacks must meet the setback requirements specified in VESCO, and listed below in Table 1, below. If an alternate setback is recommended, the rationale for the alternate setback must be included in the biotic resource or focused species assessment.

Table 9. Lake, Pond, Reservoir, and Stream Setback Requirements[6]

Type of Waterbody	Setback for Development Areas for New Vineyard and Orchard Development	Setback for Development Areas for Vineyard and Orchard Replanting
Lake	50 feet from the high water mark, unless a biotic resource assessment recommends a greater setback	Existing setback from the high water mark or 25 feet from the high water mark, whichever is greater, unless a focused species assessment recommends a greater setback
Pond	50 feet from the high water mark, unless a biotic resource assessment recommends a greater setback	Existing setback from the high water mark or 25 feet from the high water mark, whichever is greater, unless a focused species assessment recommends a greater setback
Reservoir	25 feet from the high water mark, unless a civil engineer recommends a lesser or greater setback	25 feet from the high water mark, unless a civil engineer recommends a lesser or greater setback
Streams designated as Riparian Corridors in the zoning code	Setback for agricultural cultivation required by the zoning code	Existing setback from the top of the higher bank or 25 feet from the top of the higher bank, whichever is greater, unless a focused species assessment recommends a greater setback
All other streams	25 feet from the top of the higher bank, unless a biotic resource assessment recommends a greater setback	25 feet from the top of the higher bank, unless a focused species assessment recommends a greater setback

[6] Unless a greater setback is required by the general plan, local coastal program, or zoning code.

Waterbody Mapping Methods

Waterbody mapping methods must include the following:

- Conduct field survey.
- Map each lake, pond, reservoir, and stream on an aerial photo map using data from the background data review and field survey or by using a sub-meter GPS unit to collect data in the field, and mark the high water mark or top of bank, as appropriate, of each waterbody in the field using survey stakes or wire flags.
- Map each lake, pond, reservoir, and stream setback on an aerial photo map using data from the background data review and field survey or by using sub-meter GPS unit to collect data in the field, and mark the edge of each setback in the field using survey stakes or wire flags.
- Document the existing conditions within each lake, pond, reservoir, and stream setback area, including vegetation types present and condition of vegetation, including any sparsely vegetated areas with poor existing vegetative cover.[7]

Contents

Biotic resource and focused species assessments shall contain the following sections. Additional sections may be included, as deemed necessary by the professional biologist preparing the assessment.

Information listed below is required for both biotic resource and focused species assessments, except that information marked with an asterisk (*) is only required for biotic resource assessments.

Cover Page

A cover page including the following:

- Development name.
- Applicant name and contact information.
- Property owner, if different from applicant.
- Physical address of the property, if applicable.
- Assessor's parcel number(s).
- Names of all persons conducting field surveys and reconnaissance visits.
- Survey/site visit dates.
- Date of assessment.
- Names of all persons conducting field surveys and reconnaissance visits.
- Survey/site visit dates.
- Date of assessment.

[7] Refer to the Department's Best Management Practices for New Vineyard and Orchard Development, Vineyard and Orchard Replanting, and Agricultural Grading and Drainage.

Results Summary

A summary of the results for listed species and required setbacks (See Exhibit C – Listed Species and Required Setbacks Results Summary). The entirety of the assessment must support the results documented in the summary.

Development Description

A description of the proposed development and the study area, including a current site plan, if available.

Physical and Biological Description

Based on the background data review and field survey, a description of the physical and biological resources in the study area and the potential for occurrence of listed species in the study area. The description must include the following:

- Local and development setting.
- Topography.
- Listed Species (Table 2).
- Habitat (Table 2).
- Waterbodies and potential wetlands.
- Sensitive natural communities (Table 10).*
- Vegetation.*
- Geology and soils.*
- Wildlife corridors.*
- Hydrology, including both surface and subsurface sources, drainage gradients, and surface water connections.*

Table 10. Listed Species, Natural Communities, Habitat Potentially Occurring or Known to Occur.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Rationale

Results

Results must include the following:

- Results of background data review and field survey, including any limitations.
- Listed Species:
  - Documentation of listed species.
  - Discussion of the direct and indirect impacts the proposed development may have on listed species and their habitat.
  - Determination of whether take of a listed species is reasonably foreseeable.
  - Identification of avoidance and minimization measures the applicant must implement to avoid the take of listed species, if warranted.
- Required Setbacks:
  - Description of setbacks and setback areas.[8]
  - Rationale for any alternate setbacks.
- Other Recommendations:
  - Identification of any other avoidance and minimization measures the applicant must implement to avoid potential impacts to the physical and biological resources in the study area, if warranted.*

Maps

Maps must include the following:

- Location map showing the physical address of the property.
- Site map showing the study area and proposed development area.
- Aerial photo maps identifying:
  - Study area boundary.
  - Habitat.
  - Lakes, ponds, reservoirs, and streams.
  - Setback areas.
- CNDDB species location map.*

All maps must use the most recent imagery available and include development name, north arrow, bar scale and text scale, date and source of imagery, legend, and current date.[9]

[8] If a biotic resource or focused species assessment identifies potential wetland areas, a wetlands report must be included as an appendix to the assessment.

[9] The Department's online mapping resources are available at http://sonomacounty.ca.gov/awm-map.

Photographs

Photographs must include the following:

- Sufficient number of photographs to represent the study area.
- Setback area photographs (minimum of two for each setback area).

Wetlands Appendix

If the assessment addresses, maps, or makes recommendations regarding wetlands, a wetlands report must be included as an appendix to the assessment.

References

Provide references for all documents and resources used and a list of persons consulted for the assessment.

Electronic Versions

Provide electronic versions of the assessment and all maps and related shapefiles.

Resources

California Department of Fish and Wildlife, 2003. Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander. https://www.fws.gov/arcata/es/amphibians/crlf/documents/20050801_CRLF_survey-guidelines.pdf

California Department of Fish and Wildlife, 2017. California Natural Diversity Database – Special Animals List. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Department of Fish and Wildlife, 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline

California Native Plant Society, 2011. Guidelines for Mapping Rare Vegetation. https://www.cnps.org/vegetation

U.S. Fish and Wildlife Service, 2005. Guidelines on Site Assessments and Field Surveys for California red-legged frogs. https://www.fws.gov/arcata/es/amphibians/crlf/documents/20050801_CRLF_survey-guidelines.pdf

U.S. Fish and Wildlife Service, 2005. Santa Rosa Plain Conservation Strategy. https://www.fws.gov/sacramento/es/Recovery-Planning/Santa-Rosa/santa-rosa-strategy.php

U.S. Fish and Wildlife Service, 2018. Listing and Critical Habitat Overview. https://www.fws.gov/endangered/what-we-do/listing-overview.html

U.S. Fish and Wildlife Service. ECOS Environmental Conservation Online System. https://ecos.fws.gov/ecp/

Exhibit A

Professional Biologist Qualifications Declaration for
Biotic Resource Assessments and Focused Species Assessments

Development Name: _____

Name of Professional Biologist: _____

Firm: _____

Contact Information: _____

I am the primary/lead field biologist for the above-referenced development. I have the following minimum qualifications for preparing biotic resource and focused species assessments: _____

_____

_____

Please describe your education and experience with regard to general botanical, wetland, and wildlife habitat as it pertains to biotic resource and/or focused species assessments: _____

_____

I have previously conducted independent field work and reporting, and have demonstrated the following:

☐ Specific knowledge and experience in identification of habitats and vegetation associations found in Sonoma County;

☐ Specific knowledge of local plant and animal species;

☐ Specific knowledge and experience in identifying potential impacts to plants, animals, and habitats;

☐ Specific knowledge and experience in recommending measures designed to minimize and avoid impacts to plants, animals, and habitats;

☐ Specific knowledge and experience in monitoring for compliance with biological mitigation measures;

☐ Specific knowledge and experience in writing complete, concise, and comprehensive technical reports following applicable survey protocols;

☐ Specific knowledge and experience in the various state and federal statutes, regulations, and procedures related to animal and plant surveys and collection; and

☐ Specific knowledge and experience with current state and federal survey protocols, guidelines, and manuals required for the resource being evaluated.

With my signature, I confirm that I meet all of the above qualifications and that the statements furnished in this biotic resource assessment/focused species assessment and associated maps are true and correct to the best of my knowledge.

Signature of Professional Biologist: _____ Date: _____

Exhibit B

General Field Survey Protocol

1. Conducted in the field using systematic field techniques in all habitats of the site. Ensure a thorough coverage of potential impact areas by conducting field surveys in all habitats as per standard biological techniques and federal and state protocols (as applicable) for identified listed species. More than one site visit may be required to evaluate all habitats during the appropriate season.

2. Plant survey should be floristic in nature[10] and seasonably appropriate. Every plant observed shall be identified to the extent necessary to determine its listing status. In order to properly characterize the study area and document the completeness of the survey, a complete list of plants observed in the study area should be included. This information will help to support any conclusions that the species does or does not occur in the study area if they are not observed during the field surveys. More than one site visit may be necessary to capture the diversity of a study area. If potential habitat for endangered vernal pool plants is present, then field surveys to determine the presence or absence of these plants shall be conducted in a manner consisted with protocols developed by the U.S. Fish and Wildlife Service.

3. Conducted in a manner that is consistent with conservation ethics. Collections (voucher specimens) of listed species, or suspected listed species should be made only when such actions would not jeopardize the continued existence of the population and in accordance with applicable state and federal permit requirements.

   Obtain necessary state and federal permits, collecting permits, and/or Memorandums of Understanding. Obtain necessary state and federal permits, collecting permits, and/or Memorandums of Understanding (MOUs) from the California Department of Fish & Wildlife (CDFW) or verify that your permits and MOUs are valid and up-to-date. Voucher specimens should be deposited at recognized public herbaria for future reference. Photography should be used to document plant identification and habitats whenever possible vs. collection of individuals, but especially when the population cannot withstand collection of voucher specimens.

4. Well documented. Consult the California Natural Diversity Database[11] and Spotted Owl Observations Database Biogeographic Information and Observation System BIOS[12] for known occurrences of listed species and natural communities in the proposed development area prior to field surveys. When a listed species is located, a California Native Species (or Community) Field Survey Form accompanied by a copy of the appropriate portion of a 7.5 minute topographic map with the occurrence mapped and documented using global positioning systems (GPS) and presented in a map and digital forms. Prepare CNDDB forms for listed species sightings and include a copy of your submitted CNDDB form(s) to the County, preferably as an attachment to the Biotic Resource Assessment.

[10] Floristic in nature: Every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status (CDFW, 2018).

[11] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=71831&inline=true.

[12] https://www.wildlife.ca.gov/Data/CNDDB/Spotted-Owl-Info.

Exhibit C

Listed Species and Required Setbacks Results Summary

Listed Species (check one):

☐ It is not reasonably foreseeable that the proposed development will result in the take of a listed species.

☐ It is reasonably foreseeable that the proposed development will result in the take of a listed species. The application should be denied or referred to the appropriate state and federal agencies.

Required Setbacks (check one):[13]

☐ No waterbodies or wetlands are present on the site.

☐ One or more waterbodies or wetlands are present on the site. Default and recommended setbacks for each waterbody or wetland are as follows:

Type of Waterbody of Wetland	Default Setback	Recommended Setback

[13] If a biotic resource or focused species assessment identifies potential wetland areas, a wetlands report must be included as an appendix to the assessment.

Appendix 5: Guidelines for Preparing Wetlands Reports

Purpose

To specify general guidelines for professional biologists to prepare wetlands reports for the following where potential wetlands are present:

- New vineyard and orchard development.
- Vineyard and orchard replanting.
- Agricultural grading and drainage.

Procedure

Wetlands reports shall be prepared by qualified professional biologists using the wetlands identification and mapping methods and reporting standards included in these guidelines. Wetlands reports shall identify any requirements or changes that must be incorporated into the design, layout, and/or construction of proposed development. Wetlands reports are not environmental clearance documents for purposes of complying with the California Environmental Quality Act.

Wetlands reports shall be submitted to the Department with the permit application. If a biotic resource or focused species assessment is prepared, the wetlands report must be included as an appendix to the assessment (see the Department's Guidelines for Preparing Biotic Resource and Focused Species Assessments).

Wetlands reports shall be valid for three years from the date of the report. Wetlands reports older than three years must include an addendum from a professional biologist addressing any changed conditions in the study area. The Department may forward permit applications involving wetlands to appropriate state and federal resource agencies.

Professional Biologists Qualified to Prepare

Professional biologists preparing wetlands reports shall complete a "Declaration" self-certifying that they have the qualifications and experience necessary to prepare wetlands reports (see Exhibit A – Professional Biologist Qualification Declaration for Wetlands Reports). The declaration must be signed and included in the wetlands report.

Methods

Wetlands reports shall use the approach outlined below to identify and evaluate wetlands present on a site.

The Department recommends using the 1987 U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (1987 Corps Manual)[14] and associated Regional Supplements[15] as the technical basis for identifying and mapping wetlands for wetlands reports.[16] The use of these documents is also specified in the "State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State" adopted by the State Water Resources Control Board.[17] Professional biologists should use their best professional judgement in applying the methods described in the 1987 Corps Manual and Regional Supplements, the State Water Resources Control Board Procedures, and provide a rationale for any alternative methods used.

The three-parameter approach to wetlands identification (presence of all three of the following attributes: wetland vegetation, soils, and hydrology) will generally be the approach used to determine if a "wetland" is present in most inland settings away from the Coastal zone. Note however that the definition of wetland by the State Water Resources Control Board allows for wetlands to be areas vegetated by hydrophytes but also includes "unvegetated areas" like mudflats or playas. The State Water Resources Control Board also includes detailed criteria for when various "artificial wetlands" are regulated as waters of the state. In the Coastal zone, the Coastal Commission uses a one-parameter approach to wetlands identification (presence of one or more of the following attributes: wetland vegetation, soils, and hydrology) must be used. Whether one-, two- or three-parameter approaches are required to be used should be explicitly addressed in the Wetlands Report.

Determine Study Area

The study area must be large enough to fully characterize all potential wetlands present, and include the following:

- The proposed development area.
- Any other areas that may be affected by the proposed development.
- A 100-foot buffer around those area, if feasible.

[14] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1, January 1987 Final Report. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg MS.

[15] U.S. Army Corps of Engineers. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). eds. J.S. Wakeley, R.W. Lichvar, and C.V. Noble ERDC/EL TR-08-28. Vicksburg, MS. U.S. Army Engineer Research and Development Center. U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). eds. J.S. Wakeley, R.W. Lichvar, and C.V. Noble ERDC/EL TR-10-03. Vicksburg, MS. U.S. Army Engineer Research and Development Center.

[16] Regulatory changes and/or litigation may result in modification of the definition of wetlands and their delineation methods; it is contingent upon the qualified professional biologist to use the latest USACE regulatory guidance and documents available.

[17] https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/procedures_conformed.pdf.

Background Data Review

A review of relevant background data must be conducted for all wetlands reports. The following sources must be consulted during the background data review and presented and properly cited, as relevant, in the report:

- Wetland mapping database review (i.e., California EcoAtlas, National Wetland Mapping).
- USGS 7.5 minute topographic map(s) or site-specific topographic survey, if available.
- Current site plan.
- Current general plan, local coastal program, and zoning code.
- Current Sonoma County vegetation map.[18]
- Current Sonoma County LIDAR data set.
- Current and historic aerial imagery, with dates referenced in report.
- Soils maps.
- Hydric soil lists.
- Background research for any required biotic resource or focused species assessment.

A list of background review materials is set forth in Exhibit B - Wetland Background and Field Data Form Checklist. The background data review portion of Exhibit B must be submitted with the report.

Field Survey

A field survey must be conducted for all wetlands reports. Field surveys may include a range of efforts based on the professional biologist's best professional judgement and applicable agency protocols promulgated by those agencies with potential jurisdiction over waters of the U.S., including wetlands, waters of the State, and wetlands as defined pursuant to Coastal Act guidelines. Field surveys should include vegetation mapping; application of the U.S. Army Corps of Engineers wetland survey protocols, which require an evaluation of soil, vegetation, and hydrology; and/or any other field surveys or data collection required to determine presence or absence of wetlands and wetland boundaries e.g., determination of Coastal Act wetlands.

Determine Wetland Setbacks

Wetland setbacks must meet the setback requirements specified in VESCO, and listed in Table 1, below. If an alternate setback is recommended, the rationale for the alternate setback must be included in the wetlands report.

[18] http://www.sonomavegmap.org.

Table 11. Wetland Setback Requirements.[19]

Type of Wetland	Setback for Development Areas for New Vineyard and Orchard Development, Vineyard and Orchard Replanting, and Agricultural Grading and Drainage
Wetlands designated as Biotic Habitat Areas in the general plan	100 feet from the wetland
All other wetlands	50 feet from the wetland, unless a wetlands report recommends a lesser or greater alternate setback

Wetland Identification and Mapping Methods

Wetland identification and mapping methods must include the following:

- Conduct field survey.
- Document presence/absence of wetland vegetation, soils, and hydrology indicators and rationale for determinations.
- Document potential wetlands and their boundaries.
- Evaluate any significantly disturbed areas[20] or naturally occurring "problematic" conditions that may affect wetland identification or mapping.[21]
- Map each wetland on an aerial photo map using data from the background data review and field survey or by using sub-meter GPS unit to collect data in the field, and mark the boundary of each wetland in the field using survey stakes or wire flags.
- Map each wetland setback on an aerial photo map using data from the background data review and field survey or by using sub-meter GPS unit to collect data in the field, and mark the edge of each wetland setback in the field using survey stakes or wire flags.
- Document the existing conditions within each wetland setback area, including vegetation types present and condition of vegetation, including any sparsely vegetated areas with poor existing vegetative cover.[22]
- Complete the Wetland Background and Field Data Form Checklist (Exhibit B).

[19] Unless (1) a greater setback is required by the general plan, local coastal program, or zoning code; (2) all necessary state and federal permits, approvals, or authorizations to fill the wetlands have been obtained; or (3) the filling of the wetlands is exempt from state and federal permits, approvals, or authorizations.

[20] Refer to the 1987 Manual and Regional Supplements and USACE guidance documents for additional information on significantly disturbed areas.

[21] Refer to the 1987 Manual and Regional Supplements and USACE guidance documents for additional information on naturally problematic areas.

[22] Refer to the Department's Best Management Practices for New Vineyard and Orchard Development, Vineyard and Orchard Replanting, and Agricultural Grading and Drainage.

Contents

Wetlands reports shall contain the following sections. Additional sections may be included, as deemed necessary by the professional biologist preparing the report.

Cover Page

A cover page including the following:

- Development name.
- Applicant name and contact information.
- Property owner, if different from applicant.
- Physical address of the property, if applicable.
- Assessor's parcel number(s).
- Names of all persons conducting field surveys and reconnaissance visits.
- Survey/site visit dates.
- Date of report.

Physical and Biological Description

Based on the background data review and field survey, a description of the physical and biological resources in the study area and the potential for wetlands in the study area. The description must include the following:

- Surface water flow and hydrology.
- Any flood/drought conditions (and significantly disturbed or problematic areas).[23]

[23] See Footnotes 6 and 7.

Results

Results must include the following:

- Results of the background data review and field survey, including any limitations.
- Completed Wetland Background and Field Data Form Checklist (Exhibit B), including Table B-1, Rationale for Presence or Absence of Wetland Indicators, and Table B-2, Rationale for Setback Changes.
- Discussion of wetland types and plant communities.
- List of plant species observed (both scientific and common names and wetland plant indicator status).[24]
- Review of site hydrology, including any surface and subsurface sources, drainages, surface water connections, and any man-made water sources (such as irrigation) within the study area.
- Description of soil conditions.
- Wetland resources summary table, including wetland type, acreage, and location (Table 12).
- Discussion of any limits to the wetlands report (lack of access, other limits).
- Rationale for not mapping any areas that may appear to support wetland vegetation or be saturated or ponded based on aerial imagery or site visits.
- Description of wetland setbacks and setback areas, and rationale for any alternate setbacks.

Example Table 12. Wetland Resources within Study Area.

Wetland Type	Wetland Number	Size (square feet or acres)	Description
Seasonal Wetland	#1	300 sq. ft.	Depression dominated by meadow barley (*Hordeum brachyantherum*); primary hydrology indicators include ponding of surface water (2 inches) and inundation visible on aerial photos (multiple years).

[24] Based on the most current National Wetland Plant List, Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X or as available online at U.S. Army Corps of Engineers 2016. National Wetland Plant List, version 3.3 http://wetland_plants.usace.army.mil/.

Maps

Maps must include the following:

- An aerial photo map(s) identifying:
  - Study area boundary.
  - Extent of all wetlands.
  - Wetland setback areas.
- A wetlands report map including:
  - Site map showing the study area and proposed development area.
  - Legend including area of wetland boundaries, sample points, photo points, and wetland and upland sample points (if any).
  - Wetland boundaries and setbacks.
  - Appropriate landmark labels (roads, structures, topographic features).

All maps must use the most recent imagery available and include development name, north arrow, bar scale and text scale, date and source of imagery, legend, and current date.[25]

Photographs

Photographs must include the following:

- Sufficient number of photographs to represent the study area.
- Wetland photographs (minimum two for each wetland).
- Wetland setback area photographs (minimum of two for each setback area).
- Wetland or upland data points, if applicable.

References

Provide references for all documents and resources used and a list of persons consulted for the report.

Electronic Versions

Provide electronic versions of the report and all maps and related shapefiles.

[25] The Department's online mapping resources are available at http://sonomacounty.ca.gov/awm-map.

Resources

California Wetlands Monitoring Workgroup (CWMW). 2013. California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas, Version 6.1. https://www.cramwetlands.org

Environmental Laboratory. 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineer Waterways Experiment Station, Vicksburg, MS. On-line version. www.usace.army.mil/Portals/38/docs/USACE/WetlandDelineationManual.pdf

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X or available online National Wetland Plant List, version 3.3. http://wetland_plants.usace.army.mil

U.S. Army Corps of Engineers, 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble ERDC/EL TR-08-28. Vicksburg, MS. U.S. Army Engineer Research and Development Center. http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/reg_supp/

U.S. Army Corps of Engineers, 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble ERDC/EL TR-10-03. Vicksburg, MS. U.S. Army Engineer Research and Development Center. www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/west_mt_finalsupp2.pdf

U.S. Army Corps of Engineers, 2016. Information Requested for Verification of Corps Jurisdiction. San Francisco District, revised March 2016. www.spn.usace.army.mil/Portals//docs/regulatoryInfReq.pdf

U.S. Army Corps of Engineers, 2016. Minimum Standards for Acceptance of Aquatic Resources Delineation Reports, Sacramento District, January 2016. http://www.spk.usace.army.mil/Portals/12/documents/regulatory/jd/minimum-standards/Minimum_Standards_for_Delineation_with_Template-final.pdf

U.S. Army Corps of Engineers, 2016. Updated Map and Drawing Standards for the South Pacific Division Regulatory Program. USACE, 2016. http://www.spd.usace.army.mil/Missions/Regulatory/Public-Notices-and-References/Article/651327/updated-map-and-drawing-standards

Exhibit A

Professional Biologist Qualifications Declaration for Wetlands Reports

Development Name: _____

Name of Professional Biologist: _____

Firm: _____

Contact Information: _____

I am the professional biologist for the above-referenced development. I have the following minimum qualifications for Preparing Wetlands Reports: _____

_____

_____

Please describe your education and professional experience related to general biological, botanical, wetland, soils, hydrology, or other areas of expertise as it pertains to wetland identification, mapping, and evaluation:

_____

_____

I have obtained the following wetland training (please check only those that apply):

☐ Use of 1987 Corps of Engineers Wetlands Delineation Manual

☐ Use of Regional Supplements to the 1987 Corps of Engineers Wetlands Delineation Manual

(Western Mountains and Valleys and Coast Region and/or Arid West Region Manuals)

☐ Advanced Wetland Delineation

☐ Vegetation Identification for Wetlands/Wetland Botany

☐ Advanced Hydric Soils/Problem Soils

☐ Advanced Hydrology Indicators

☐ Wetland Mapping

☐ Problematic Wetland Delineation Methods

☐ Wetland Restoration

☐ Wetland Regulation

☐ Other wetland training (please specify): _____

_____

☐ California Rapid Assessment Method (please specify training modules): _____

_____

☐ Other wetland monitoring and assessment methods (please specify): _____

_____

I have obtained the following professional wetland delineation certifications (please check all that apply):

☐ Society of Wetland Scientist Professional Wetland Scientist (PWS) Certification

☐ Society of Wetland Scientist Wetland Professional in Training (WPIT)

☐ Other Wetland Delineation Certification (please specify type of certification and organization): _____

_____

In addition to the wetland training specified above, I have previously conducted independent field work and reporting, and have demonstrated the following:

☐ Specific knowledge and experience in identification of habitats and vegetation associations found in Sonoma County, including wetland and riparian habitats;

☐ Specific knowledge of wetland plant, soils and hydrology indicators, and methods used to evaluate wetland indicators;

☐ Specific knowledge of procedures and methods used to delineate wetlands;

☐ Specific knowledge and experience in mapping wetlands;

☐ Specific knowledge and experience in identifying potential impacts to wetlands;

☐ Specific knowledge and experience in recommending measures designed to minimize and avoid impacts to wetlands;

☐ Specific knowledge and experience in writing complete, concise, and comprehensive technical reports following applicable manuals, guidance and procedure documents;

☐ Specific knowledge and experience in the various local, regional, state, and federal statutes, regulations, and procedures related to wetlands; and

☐ Specific knowledge and experience with current state and federal wetland delineation guidance documents, guidelines, and manuals.

With my signature, I confirm that I meet all the above qualifications and that the statements furnished in this wetlands report and associated maps are true and correct to the best of my knowledge.

Signature: _____ Date: _____

Exhibit B

Wetland Background and Field Data Form Checklist

Development Name: _____ **Date:** _____

Address: _____ **City:** _____

Investigator(s): _____

Background Data Review

☐ USGS 7.5 minute topo maps Quads: _____

☐ Current aerial photo images: Google Earth/Other Source: _____

Date: _____

☐ Historical aerial photo images: Google Earth/Other Source: _____

Date: _____

☐ Sonoma Veg Map (Vegetation Habitat, LIDAR)

☐ California ECOAtlas

☐ NRCS Soil Map

☐ NRCS Hydric Soils Lists

☐ National Wetland Inventory (NWI) Mapping

☐ National Hydrography Data (NHD) Mapping

☐ Hydrologic Unit Code (HUC) Watershed

☐ NRCS Climate Analysis for Wetlands Tables (WETS) Table

☐ FEMA Flood Maps

☐ BIOS Biographic Information and Observation System/Rare Find (CNDDB)

☐ Contacts with landowner/land managers: _____

☐ Other: _____

Field Review

☐ Site visit/reconnaissance field survey Date: _____

☐ Use of 1987 Corps Manual and Regional Supplement (Arid West or Western, Mountain Valley and Coast)

☐ USACE Regional Supplement Wetland Determination Form(s)

☐ Hydrophytic vegetation evaluation or sample point

☐ Wetland hydrology evaluation or sample point

☐ Hydric soil evaluation or sample point

☐ Munsell Color Charts

☐ NRCS Field Indicators of Hydric Soils

☐ National Wetland Plant List

☐ Hydrology mapping (wet, saturated or ponded areas)

☐ Evaluation for typical climatic/hydrologic conditions

☐ Use of one (1) parameter wetland identification method (Coastal zone only)

☐ Evaluation for disturbance or altered areas

☐ Sample points flagged/labeled in field

☐ Construction fencing installed around wetland

☐ Use of remote sensing tools (GPS) Specify: _____

☐ Other: _____

☐ Other: _____

Table B-1: Rationale for Presence or Absence of Wetland Indicators[26] Area # _____.

Parameter	**Description (include any wetland indicators, per USACE 1987 Corps Manual and Regional Supplements)[26]**	**Wetland Parameter Present (Yes/No)**	**Rationale for Presence or Absence Wetland Parameter**
Vegetation			
Soils			
Hydrology			
Sample Area # _____	Is the Sample Area within a wetland? YES NO		
Summary of Findings and Rationale			

[26] The 1987 Corps Manual and Regional Supplements (or most current USACE methodology) should be used as the technical basis for determination of presence of wetland vegetation, soil and hydrology indictors, and potential wetlands.

Table B-2: Rationale for setback changes.

Check all that apply or "none" for each category below. Any recommendations to reduce wetland setbacks from the setbacks specified in VESCO (See Table 1) must confirm that there are no wetlands designated as Biotic Habitat Areas in the general plan or other "high" quality wetlands that have or support any of the high quality wetland conditions listed below.

A. Wetlands Designated as Biotic Habitat Areas in the General Plan

☐ Wetlands designated as Biotic Habitat Areas in the General Plan

OR

☐ None. No wetlands designated as Biotic Habitat Areas in the General Plan are present

B. High Quality Wetland Conditions

☐ Threatened or Endangered Species or their habitat

☐ Designated Critical Habitat

☐ Significant breeding or concentration area for wildlife or rare plants/vegetation

☐ High native plant or wildlife species diversity and abundance

☐ Habitat lacking or with limited anthropogenic disturbances

☐ Surrounding habitat that is undeveloped/unaltered

☐ Other (describe): _____

OR

☐ None. No high quality wetland conditions are present

C. Moderate to Low Quality Wetland Conditions

☐ Sparse vegetation/limited vegetation cover (describe): _____

_____

☐ Anthropogenic disturbances (describe): _____

_____

☐ High invasive plant species cover or dominance (list species and percent cover): _____

_____

☐ Habitat surrounding wetland intensely developed or highly altered (describe): _____

_____

☐ Other (describe): _____

_____

OR

☐ None. No moderate to low quality wetland conditions are present.

Provide the rationale for any changes to the wetland setbacks specified in VESCO (See Table 1). Recommendations for alternate setbacks must 1) describe the qualities and condition of the wetland setback area, and 2) provide the rationale for any differences using the conditions checked above under **B. High Quality Wetland Conditions** or **C. Moderate to Low Quality Wetland Conditions.**

1. **Description of wetland setback area:**

2. **Rationale for alternate setback:**

Appendix 6: Length of Slope (LS) Values

Percent Slope	Length of Slope (feet)										
	25’	50’	75’	100’	125’	150’	200’	250’	300’	350’	400’
0.5%	0.07	0.08	0.09	0.10	0.10	0.10	0.11	0.11	0.12	0.12	0.13
1.0%	0.09	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20
2.0%	0.13	0.16	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.29	0.30
3.0%	0.19	0.23	0.26	0.29	0.31	0.32	0.35	0.38	0.40	0.42	0.43
4.0%	0.23	0.30	0.36	0.40	0.44	0.47	0.53	0.58	0.62	0.66	0.70
5.0%	0.27	0.38	0.46	0.53	0.60	0.65	0.76	0.85	0.93	1.00	1.07
6.0%	0.34	0.47	0.58	0.67	0.75	0.82	0.95	1.06	1.16	1.26	1.34
7.0%	0.41	0.58	0.71	0.82	0.92	1.01	1.16	1.30	1.43	1.54	1.65
8.0%	0.49	0.70	0.86	0.99	1.11	1.21	1.40	1.56	1.71	1.85	1.98
9.0%	0.59	0.83	1.01	1.17	1.31	1.43	1.66	1.85	2.03	2.19	2.34
10.0%	0.68	0.96	1.17	1.35	1.51	1.66	1.92	2.14	2.35	2.53	2.71
12.0%	0.87	1.23	1.51	1.74	1.95	2.13	2.46	2.75	3.02	3.26	3.48
14.0%	1.08	1.52	1.86	2.15	2.4	2.63	3.04	3.40	3.73	4.02	4.30
16.0%	1.29	1.82	2.23	2.58	2.88	3.16	3.65	4.08	4.47	4.82	5.16
18.0%	1.51	2.14	2.62	3.02	3.38	3.70	4.27	4.78	5.23	5.65	6.04
20.0%	1.74	2.46	3.01	3.48	3.89	4.26	4.92	5.50	6.02	6.51	6.96
22.0%	1.97	2.79	3.42	3.94	4.41	4.83	5.58	6.24	6.83	7.38	7.89
24.0%	2.21	3.12	3.83	4.42	4.94	5.41	6.25	6.99	7.65	8.26	8.84
26.0%	2.45	3.46	4.24	4.90	5.48	6.00	6.93	7.74	8.48	9.16	9.80

Percent Slope	Length of Slope (feet)							
	450’	500’	550’	600’	700’	800’	1000’	1200’
0.5%	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.16
1.0%	0.20	0.21	0.22	0.22	0.23	0.24	0.26	0.27
2.0%	0.32	0.33	0.33	0.34	0.36	0.37	0.40	0.42
3.0%	0.45	0.46	0.48	0.49	0.51	0.54	0.57	0.60
4.0%	0.73	0.76	0.79	0.82	0.87	0.92	1.00	1.08
5.0%	1.13	1.20	1.25	1.31	1.41	1.51	1.69	1.85
6.0%	1.42	1.50	1.57	1.65	1.78	1.90	2.12	2.33
7.0%	1.75	1.84	1.93	2.02	2.18	2.33	2.60	2.85
8.0%	2.10	2.21	2.62	2.42	2.62	2.80	3.13	3.43
9.0%	2.48	2.62	2.75	2.87	3.10	3.31	3.70	4.06
10.0%	2.87	3.03	3.18	3.32	3.58	3.83	4.28	4.39
12.0%	3.69	3.89	4.08	4.27	4.61	4.93	5.51	6.03
14.0%	4.56	4.81	5.04	5.27	5.69	6.08	6.80	7.45
16.0%	5.47	5.77	6.05	6.32	6.82	7.29	8.15	8.93
18.0%	6.41	6.76	7.09	7.40	7.99	8.55	9.56	10.5
20.0%	7.38	7.78	8.16	8.52	9.20	9.84	11.0	12.0
22.0%	8.37	8.82	9.25	9.66	10.4	11.2	12.5	13.7
24.0%	9.37	9.88	10.4	10.8	11.7	12.5	14.0	15.3
26.0%	10.4	11.0	11.5	12.0	13.0	13.9	15.5	17.0

Vegetation Factor (C) Values

Vegetation Factor (C_i)									
Vegetation Factor (C) Values for Pasture, Rangeland, and Idle Land	**Type and Height of Canopy**	**Canopy Cover (%)**	**Canopy Type**	**Percent Ground Cover**					
				0%	20%	40%	60%	80%	95 -100%
	No significant canopy	0	G	**0.45**	**0.20**	**0.10**	**0.042**	**0.013**	**0.003**
			W	**0.45**	**0.24**	**0.15**	**0.090**	**0.043**	**0.011**
	Canopy of tall weeds or short brush (average drop height[2] of ≥20 inches or 0.5 m fall height)	25	G	**0.36**	**0.17**	**0.09**	**0.038**	**0.012**	**0.003**
			W	**0.36**	**0.20**	**0.13**	**0.082**	**0.041**	**0.011**
		50	G	**0.26**	**0.13**	**0.07**	**0.035**	**0.012**	**0.003**
			W	**0.26**	**0.16**	**0.11**	**0.075**	**0.039**	**0.011**
		75	G	**0.17**	**0.10**	**0.06**	**0.031**	**0.011**	**0.003**
			W	**0.17**	**0.12**	**0.09**	**0.067**	**0.038**	**0.011**
	Appreciable brush or bushes (2 m fall height)	25	G	**0.40**	**0.18**	**0.09**	**0.040**	**0.013**	**0.003**
			W	**0.40**	**0.22**	**0.14**	**0.085**	**0.042**	**0.011**
		50	G	**0.34**	**0.16**	**0.09**	**0.038**	**0.012**	**0.003**
			W	**0.34**	**0.19**	**0.13**	**0.081**	**0.041**	**0.011**
		75	G	**0.28**	**0.14**	**0.08**	**0.036**	**0.012**	**0.003**
			W	**0.28**	**0.17**	**0.12**	**0.077**	**0.040**	**0.011**
	Trees but no appreciable low brush (4 m fall height)	25	G	**0.42**	**0.19**	**0.10**	**0.041**	**0.013**	**0.003**
			W	**0.42**	**0.23**	**0.14**	**0.087**	**0.042**	**0.011**
		50	G	**0.39**	**0.18**	**0.09**	**0.040**	**0.013**	**0.003**
			W	**0.39**	**0.21**	**0.14**	**0.085**	**0.042**	**0.011**
		75	G	**0.36**	**0.17**	**0.09**	**0.039**	**0.012**	**0.003**
			W	**0.36**	**0.20**	**0.13**	**0.083**	**0.047**	**0.011**
	Mechanically prepared sites, with no live vegetation and no topsoil, and no litter mixed in	0	N	0.94	0.44	0.30	0.200	0.100	Not given

Vineyard Cover Factor (C_f)					
Vine Row Tilled Ground Cover (%) Winterization Months					
0%	20%	40%	60%	80%	95%
0.85	**0.39**	**0.20**	**0.088**	**0.028**	**0.007**
Vine Row Non-Tilled Ground Cover (%) Winterization Months					
0%	20%	40%	60%	80%	95%
0.68	**0.31**	**0.16**	**0.070**	**0.022**	**0.006**

Erosion Control Practice Factor (P)

Slope	Vineyard Practices – P Factor				
	Up and Down Hill	**Cross-Slope[27] with Tilling**	**Terrace[28] with Tilling**	**Cross-Slope, No Tilling**	**Terrace, No Tilling**
2 – 7%	1	0.75	0.5	0.37	0.25
7.1 – 12%	1	0.8	0.6	0.45	0.3
12.1 – 18%	1	0.9	0.8	0.6	0.4
18.1 - 24%	1	0.95	0.9	0.67	0.45

[27] Must be near perpendicular to fall line to qualify.

[28] Terraces assumed to be cut or graded, not disked.

Appendix 7: VESCO Notes

New Vineyard and Orchard Development and Vineyard and Orchard Replanting Notes

- All work shall be performed in compliance with the approved plans and specifications. The approved plans and specifications shall not be changed without the written approval of the agricultural commissioner. Proposed modifications to the approved plans and specifications shall be submitted to the agricultural commissioner in writing, together with all necessary technical information and design details. The contractor shall immediately notify the property owner and engineer of record, if applicable, upon discovering discrepancies, errors, or omissions in the approved plans. Prior to proceeding, the property owner shall have the approved plans revised to clarify identified discrepancies, errors, or omissions. The agricultural commissioner may require unauthorized work to be redone or removed to verify compliance with VESCO. The agricultural commissioner may initiate enforcement action and seek the imposition of civil penalties for violations of VESCO.

- Prior to the start of any new vineyard or orchard development, vineyard or orchard replanting, or agricultural grading or drainage work, the permittee shall have a pre-construction consultation with the agricultural commissioner.

- The permittee shall notify the agricultural commissioner of any change in ownership of the site prior to completion of the work.

- The work shall be subject to inspection as required by the agricultural commissioner. The permittee shall provide adequate access to the site for inspection by inspectors designated by the agricultural commissioner during the performance of all work and for a minimum of three years after final inspection.

- The agricultural commissioner may require professional inspections and certifications to verify proper completion of the work. Where the use of professional personnel is required, these personnel shall immediately report in writing to the agricultural commissioner and the permittee any instance of work not in compliance with VESCO, and other applicable provisions of the Code, the approved plans and specifications, or any permit conditions, and shall also provide recommendations for corrective measures, if determined by the professional to be necessary. If professional personnel is changed during the course of the work, the work shall be stopped until the replacement individual notifies the agricultural commissioner in writing of the change of professional and the new professional notifies the agricultural commissioner in writing of their agreement to accept responsibility for approval of the completed work within the area of their technical competence.

- The permittee shall contact the Underground Service Alert (USA) prior to starting any excavation that will be conducted in an area that is known, or reasonably should be known, to contain subsurface utility installations. Contact shall occur at least two working days, but not more than fourteen calendar days before the excavation starts.

- The agricultural commissioner shall not give final approval until a final inspection of the work has been completed and approved by the agricultural commissioner and all work has been completed in compliance with the approved plans and specifications, and following plans and reports that the agricultural commissioner may require, supplements thereto, or other documentation, prepared by the appropriate professionals in the format required by the agricultural commissioner: as-built plans, testing records, and declarations about completed work. The agricultural commissioner may also require such plans and reports at other stages of the work.

- In the event cultural resources (such as historical, archaeological, and paleontological resources) and/or human remains are discovered during grading or other construction activities, work shall immediately be halted within the vicinity of the find, the agricultural commissioner shall be notified, and the following shall occur before work may be resumed:

    - The Northwest Information Center shall be notified at (707) 588-8455.
    - A qualified archeologist shall be consulted for an on-site evaluation. Additional mitigation may be required by the County per the archeologist's recommendations and Section 36.20.040 of VESCO.
    - If human burials or human remains are encountered, the contractor shall also notify the County Coroner at (707) 565-5070.

- New vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage shall not remove or disturb trees and other vegetation except in compliance with the approved plans and specifications. The limits of the development area shall be clearly identified and delineated on the approved plans and specifications and defined and marked in the field to prevent damage to surrounding trees and other vegetation. Trees and other vegetation within the limits of the development area that are to be retained shall be identified and protected from damage by marking, fencing, or other measures.

- New vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage shall prevent or control soil and other pollutant discharges during qualifying rain events by implementing erosion prevention or control measures detailed on the approved project plans at least 48 hours prior to any qualifying rain event, unless the site has been winterized pursuant to Section 36.20.150 of VESCO.

- Initial planting work for Level I and Level II new development shall be permitted from October 1 to November 15 and April 1 to April 30 when on-site soil conditions permit the work to be performed in compliance Article 20 of VESCO and sufficient materials are available on-site to implement the erosion prevention or control measures required by Section 36.20.130.B of VESCO, if necessary. Initial planting work for Level I and Level II new development shall be prohibited from November 16 to March 31, except for emergency work to protect life or property, or to implement erosion prevention or control measures.

- Final planting work for Level I and Level II new development shall be permitted during the rainy season when on-site soil conditions permit the work to be performed in compliance with Article 20 of VESCO and sufficient materials are available on-site to implement the erosion prevention or control measures required by Section 36.20.140 of VESCO, if necessary.

- Initial replanting work for Level I and Level II replanting shall be permitted from October 1 to November 14 and April 1 to April 30 when on-site soil conditions permit the work to be performed in compliance Article 20 of VESCO and sufficient materials are available on-site to implement the erosion prevention or control measures required by Section 36.20.130.B of VESCO, if necessary. Initial replanting work for Level I and Level II replanting shall be prohibited from November 16 to March 31, except for emergency work to protect life or property, or to implement erosion prevention or control measures.

- Final replanting work Level I and Level II replanting shall be permitted during the rainy season when on-site soil conditions permit the work to be performed in compliance Article 20 of VESCO and sufficient materials are available on-site to implement the erosion prevention or control measures required by Section 36.20.130.B of VESCO, if necessary.

- New vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage sites shall be winterized in compliance with Section 36.20.150 of VESCO each year until all work has been completed.

- The property owner shall be responsible for ensuring that the winterization measures required by Section 36.20.150 of VESCO are installed properly. Each year until all work has been completed, the property owner or an authorized agent of the property owner shall notify the agricultural commissioner in writing when the winterization measures required by Section 36.20.150 of VESCO are in place and functional, and certify in writing that the winterization measures have been installed in compliance with the department's best management practices for new vineyard and orchard development, vineyard and orchard replanting, and agricultural grading and drainage, the approved plans and specifications, and the requirements of Table 36-9 of VESCO.

- The property owner shall be responsible for ensuring that after installation the winterization measures required by Section 36.20.150 of VESCO operate properly and are maintained through March 31 of each year until all work has been completed.

Agricultural Grading and Drainage Notes

- Perform agricultural grading and drainage in accordance with VESCO, applicable Sonoma County regulations and, if applicable, the recommendations of the soils report prepared by _____ and dated ____/____/_____.

- The agricultural grading or drainage permit and a copy of the approved plans and specifications shall be maintained on the project site throughout the duration of construction activities.

- The agricultural commissioner may order that any work stop immediately if it is performed contrary to VESCO, the approved plans and specifications, permit conditions, or any work that has become hazardous to property or the public.

- Issuance of an agricultural grading or drainage permit by the agricultural commissioner does not eliminate the responsibility of the property owner to secure permits from other agencies with regulatory responsibilities for the uses and construction activities associated with the work shown on the approved plans and specifications. Failure to obtain all required permits may result in fines from other agencies.

- Agricultural grading shall be limited to the grading area identified and delineated on the approved plans and specifications.

- Development areas for agricultural grading and drainage shall be set back from lakes, ponds, reservoirs, streams, and wetlands in compliance with the requirements of Sections 36.20.090 – 36.20.120 of VESCO. No heavy equipment or work-related ground disturbance shall be allowed in any setback area without approved permits.

- Should agricultural grading operations encounter hazardous materials, or what appear to be hazardous materials, stop work immediately in the contaminated area and contact 911 or the appropriate agency for further instructions.

- Contours, elevations, and shapes of finished surfaces shall be blended with adjacent natural terrain to achieve a consistent grade and natural appearance. Borders of cut slopes and fill shall be rounded off to a minimum radius of 5 feet to blend with the natural terrain.

- Ground surfaces shall be prepared to receive fill by removing vegetation, top soil, and other unsuitable materials, and scarifying the ground to provide a bond with the fill material.

- Fill material shall not include organic, frozen, or other deleterious materials. No rock or similar irreducible material greater than 6 inches in any dimension shall be included in fills, except where a civil engineer devises a method of placement of larger rock, continuously inspected its placement, and approves fill stability. Potential rock disposal areas shall be shown on the plans and specifications. Rocks shall be placed so as to ensure filling of all voids with well-graded soil.

- Fills shall be constructed in lifts not exceeding 8 inches in depth. Completed fills shall be stable, well-integrated, and bonded to adjacent materials and the materials on which they rest. Fills shall be competent to support anticipated loads and be stable at the design slopes shown on the approved plans and specifications.

- Fills below 30 inches from finished grade shall be compacted to a minimum of 90 percent of maximum dry density, as determined by ASTM D 1557, Modified Proctor, or as specified by a civil engineer.

- Fill at or above 30 inches from finished grade shall be compacted to a minimum density necessary for the intended use or as specified by a soils engineer.

- Footings that may be affected by any excavation shall be underpinned or otherwise protected against settlement and shall be protected against lateral movement. Fills or other surcharge loads shall not be placed adjacent to any building or structure unless the building or structure is capable of withstanding the additional loads caused by the fill or surcharge. The rights of adjacent affected property owners shall be as set forth in Civil Code section 832.

- Agricultural grading and drainage shall be permitted during the rainy season from October 1 to November 15 and April 1 to April 30 when on-site soil conditions permit the work to be performed in compliance Article 20 of VESCO and sufficient materials are available on-site to implement the erosion prevention or control measures required by Section 36.20.130.B of VESCO, if necessary. Agricultural grading and drainage shall be prohibited between November 16 and March 31, except for emergency work to protect life or property, or to implement erosion prevention or control measures.

Biological and/or Botanical Notes

- All setbacks required by Article 20 of VESCO and any technical reports shall be marked in the field prior to construction.

Appendix 8: Glossary

Agricultural Avenue. A seasonal road around or through a vineyard or orchard block, or an area at the end of a vine or tree row where vehicles and equipment can turn around.

Agricultural Commissioner. The agricultural commissioner-sealer of the county or his or her authorized representative.

Agricultural Crop. Any cultivated crop grown and harvested for commercial purposes, except for cannabis and other controlled substances.

Agricultural Cultivation. The act of preparing the soil for the raising of agricultural crops, as defined herein.

Agricultural Drainage. Any drainage alteration for agricultural purposes other than for private roads and driveways, dams, reservoirs, lakes, ponds, and structures.

Agricultural Drainage Permit. See Section 36.12.010.

Agricultural Grading. Any grading for agricultural purposes other than for private roads and driveways, dams, reservoirs, lakes, ponds, and structures.

Agricultural Grading Permit. See Section 36.10.010.

Agricultural Purpose. See agriculture.

Agricultural Road. A year-round road that connects vineyard or orchard blocks.

Agricultural Road Network. The agricultural roads and avenues constructed or modified to serve a vineyard or orchard.

Agriculture. The production of food, fiber, plant materials, and the raising and maintaining of horses, donkeys, mules, and similar livestock and farm animals.

Approved Plans and Specifications. Plans and specifications, including reports, material lists, estimates, maintenance agreements, and professional recommendations, approved by the agricultural commissioner pursuant to this chapter.

Architect. A person licensed by the state to practice architecture.

Area of Slope Instability. An area of soil or rock prone to mass wasting, including slides, falls, slumps, and flows.

As-Built Plans. Plans or drawings that depict the final installed configuration of new vineyard or orchard development, vineyard or orchard replanting, or agricultural grading or drainage (whether physical or functional). The plans or drawings shall indicate any construction deviations and show all features as actually built. The plans or drawings are intended to provide a permanent record of as-built conditions and aid as key references for future maintenance processes.

Bench. A relatively level step excavated into earth material on which fill is to be placed.

Best Management Practice. A program, technology, process, siting criteria, operational method, or engineered system, which when implemented prevents, controls, removes, or reduces pollution or other adverse environmental effects.

Biotic Resource Assessment. A report prepared by a professional biologist in compliance with department guidelines to identify and document any biotic resources present on a site. The report must include the identification of potential direct or indirect impacts to listed species, aquatic resources, sensitive terrestrial habitats, and/or potential habitat suitable to support listed species. The report shall also document the location of required setbacks and recommend any avoidance and minimization requirements or other actions that must be implemented to avoid the take of listed species.

Blue-line Stream. A stream that appears as a broken or solid blue line (or a purple line) on a USGS topographic map.

California Environmental Quality Act (CEQA). Public Resources Code section 21000 et seq.

Civil Engineer. A person licensed by the state to practice civil engineering.

Commercial Orchard. Any orchard producing fruit or nuts for commercial purposes.

Commercial Vineyard. Any vineyard producing wine grapes for commercial purposes.

Compaction. The densification of a fill by mechanical means.

Contiguous vegetation. Vegetation that is physically touching or adjacent, and not separated by features like roads, developed land, or cropland.

County Land Use Approval. A discretionary permit or approval granted by the county pursuant to Chapter 25, 26, or 26C of this code.

Crop Production. The commercial growing and harvesting of agricultural crops, including horticultural or ornamental shrubs, plants, flowers, trees, vines, fruits, vegetables, hay, grain, and similar food and fiber crops or agricultural commodities, except for cannabis or other controlled substances.

Cut. See excavation.

Deep Ripping. The mechanical manipulation of the soil at depths greater than 16 inches to break up or pierce highly compacted, impermeable or slowly permeable subsurface soil layers, or other similar kinds of restrictive soil layers.

Department. The Department of Agriculture/Weights & Measures of the county.

Department's Best Management Practices for New Vineyard and Orchard Development, Vineyard and Orchard Replanting, and Agricultural Grading and Drainage. The best management practices adopted or amended by the agricultural commissioner pursuant to Section 36.02.060.

Design Discharge. See the Flood Management Design Manual.

Designated Critical Habitat Area. The critical habitat for a listed species designated by the U.S. Fish and Wildlife Service or NOAA Fisheries pursuant to 16 U.S.C. § 1532(5).

Designated Watershed or Sub-Watershed. A watershed or sub-watershed designated in the general plan.

Development Area. All areas subject to ground disturbance related to new vineyard or orchard development, vineyard or orchard replanting, or agricultural grading or drainage, including the new planting, replanting, grading, or drainage alteration area, agricultural road network and other vineyard or orchard infrastructure, staging areas for vehicles, supplies, and equipment, and material storage areas.

Discretionary Permit Application. A permit application that includes a request pursuant to Section 36.14.030.D for relief from the standards in Article 20.

Down Drain. A device for collecting water from a swale or ditch located on or above a slope, and safely delivering it to an approved drainage facility.

Drainage. Refers to the collection, conveyance, containment, and/or discharge of stormwater runoff.

Drainage Alteration. Construction or modification of any drainage facility or system.

Drainage Alteration Area. The area subject to agricultural drainage.

Drainage Facility. A constructed component of a drainage system.

Drainage System. Constructed and/or natural features that work together to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat, or filter stormwater runoff, including detention and retention basins, overland flow paths, pipes, channels, and the inlets and outlets to these features.

Earth Material. Any rock or natural soil or combination thereof.

Embankment. A fill consisting of a deposit of soil, rock, or other materials mechanically placed.

Erosion. The process by which soil particles are detached and transported by the actions of wind, water, or gravity.

Excavation. The removal of earth material by artificial means, also referred to as a cut.

Existing Grade. The grade of an area in its current form.

Existing Slope. The slope of an area in its current form.

Fill. The deposition of earth material by artificial means. Fill does not include soil amendment and fertilizing materials.

Final Planting Work. The work undertaken as part of the final phase of new vineyard or orchard development, including laying out of vineyard or orchard blocks and vine or tree rows, construction or modification of aboveground vineyard or orchard infrastructure, planting of grapevines or orchard trees, and other similar work.

Final Replanting Work. The work undertaken as part of the final phase of vineyard or orchard replanting, including laying out of vineyard or orchard blocks and vine or tree rows, construction or modification of aboveground vineyard or orchard infrastructure, planting of grapevines or orchard trees, and other similar work.

Finished Grade. The grade at the conclusion of all agricultural grading efforts.

Flood Management Design Manual. The Flood Management Design Manual, Sonoma County Water Agency, latest edition.

Flood-Prone Urban Area. The area within the boundaries defined on the north by River Road; on the west by the easterly boundary of the Laguna de Santa Rosa to its intersection with Highway 12 and continuing with the easterly limit of the city of Sebastopol to Highway 116; on the south by Highway 116 to its intersection with Old Redwood Highway then south to East Cotati Avenue and east to its intersection with Petaluma Hill Road; and on the east by Petaluma Hill Road, north to Highway 12 then west to Highway 101 and north to River Road.

Focused Species Assessment. A report prepared by a professional biologist in compliance with department guidelines to identify and document any habitat present on a site in a designated critical habitat area. The report must include the identification of potential direct or indirect impacts to listed species, aquatic resources, sensitive terrestrial habitats, and/or potential habitat suitable to support listed species. The report shall also document the location of required setbacks and recommend any avoidance and minimization requirements or other actions that must be implemented to avoid the take of listed species.

General Plan. The Sonoma County General Plan.

Geologic Hazard. Slope instability, landsliding, fault displacement, liquefaction, flooding, subsidence, differential settlement, expansive soil, creeping soil, or other similar geologic condition, either mapped or observed in the field.

Geologic Hazard Area Combining District. See Article 70 of Chapter 26 and Article XXV of Chapter 26C of this code.

Geologic Report. A report prepared by a professional geologist in compliance with department guidelines to be utilized in the planning, design, construction, and maintenance of new vineyard or orchard development or vineyard or orchard replanting.

Geotechnical Engineer. A civil engineer licensed by the state to practice geotechnical engineering.

Geotechnical Report. A soils report prepared by a geotechnical engineer.

Grade. The vertical location of the ground surface.

Grading. An excavation or fill or combination thereof. Grading does not include routine farming practices, such as soil preparation, planting, seeding, and other similar activities.

Grading Area. The area subject to agricultural grading.

Grapevine. A perennial grape-bearing vine.

Ground Disturbance. Any activity that disturbs or compacts the ground.

Highly Erodible Soils. Soils in the Diablo, Dibble, Goldridge, Laughlin, Los Osos, Steinbeck, and Suther soil series as mapped by the U.S. Department of Agriculture.

Hobby Orchard. Any orchard producing fruit or nuts for non-commercial hobby purposes.

Hobby Vineyard. Any vineyard producing wine grapes for non-commercial hobby purposes.

Initial Planting Work. The work undertaken as part of the initial phase of new vineyard or orchard development, including land clearing, vegetation removal, soil preparation, agricultural grading, construction or modification of vineyard or orchard infrastructure, and other similar work.

Initial Replanting Work. The work undertaken as part of the initial phase of vineyard or orchard replanting, including removal of existing grapevines or orchard trees, soil preparation, agricultural grading, construction or modification of vineyard or orchard infrastructure, and other similar work.

Invasive Plant Species. A plant species that has a rating of moderate or higher level of invasiveness on the most recent California Invasive Plant Council Invasive Plant Inventory. Examples of invasive plants include Himalayan blackberry (Rubus armeniacus), giant reed (Arundo donax), salt cedar (Tamarix sp.) and star thistle (Centaurea solstitialis).

Irrigation System. Equipment and facilities installed to apply water for irrigation and frost protection, including water source, water distribution network, control components, emission devices, and other irrigation equipment.

Key. A compacted fill placed in a trench excavated in earth material beneath the toe of a slope.

Lake. A permanent natural body of water, or an artificially impounded body of water, isolated from the sea, with at least one acre of open water of sufficient depth and permanency to prevent complete coverage by rooted aquatic plants

Land Clearing. The removal of trees, stumps, brush, rocks, and other obstacles from an area.

Landscape Architect. A person licensed by the state to practice landscape architecture.

Level I New Development. See Table 36-1.

Level II New Development. See Table 36-1.

Level I Replanting. See Table 36-2.

Level II Replanting. See Table 36-2.

Licensed Professional. An architect, civil engineer, landscape architect, professional forester, or professional geologist.

Listed Species. Any plant or animal species protected by the federal Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.) or the state Fish and Game Code.

Local Coastal Program. The Sonoma County Local Coastal Program.

Ministerial Permit Application. A permit application that does not include a request pursuant to Section 36.14.030.D for relief from the standards in Article 20.

MS4 Permit. A Municipal Separate Storm Sewer Systems National Pollutant Discharge Elimination System Permit.

New Orchard Development. The planting of a new orchard, increasing the footprint of an existing orchard, or replanting all or part of an existing orchard that does not qualify as orchard replanting, as defined herein.

New Planting Area. The area subject to new vineyard or orchard development.

New Vineyard Development. The planting of a new vineyard, increasing the footprint of an existing vineyard, or replanting all or part of an existing vineyard that does not qualify as vineyard replanting, as defined herein.

Non-Cohesive Soil. Soil where the particle size of the smaller than 2 mm fraction of the soil is coarser than Loam as defined by the Natural Resources Conservation Service soil texture classification scheme.

Orchard. A planting of orchard trees. Land devoted to the cultivation of such a planting.

Orchard Infrastructure. The agricultural road network, equipment turnarounds, drainage system, irrigation system, and other basic facilities and systems needed for the operation of an orchard.

Orchard Replanting. The replanting of all or part of an existing orchard where the orchard is under active cultivation and the footprint of the area to be replanted is not increased.

Orchard Tree. A fruit- or nut-bearing tree.

Permit Application. An application for a permit required by this chapter.

Permit Holder. The owner of the site. See Section 36.16.020.C.

Permittee. The permit holder or an authorized agent of the permit holder.

Person. Any individual, firm, partnership, corporation, company, association, joint stock association; city, county, state, or district; tribe; and includes any trustee, receiver, assignee, or other similar representative thereof.

Pit. An earthen excavation designed to store water.

Pond. A body of still freshwater smaller than a lake, often artificially impounded.

Professional Biologist. A person possessing academic and professional experience in biological sciences and related resource management activities who is able to identify biotic resources and can recognize and is familiar with the habitats and behaviors of listed species that may be present in the county. The person must have specialized skills and training and any required licenses/permits/certifications specific to the study being conducted (e.g., general botany and plant ecology, wetland ecology and delineation, and wildlife habitat knowledge for biotic resource assessments and focused species assessments, wetland ecology and delineation for wetlands reports, applicable permits to handle special status species for presence/absence surveys).

Professional Forester. A person licensed by the state to practice forestry.

Professional Geologist. A person licensed by the state to practice geology.

Public Agency. Any state or federal agency, any city, county, or special district.

Qualifying Rain Event. Any weather pattern that is forecasted by the National Weather Service to have a 50 percent or greater chance of producing 0.5 inches or more precipitation on a site within a 48 hour or greater period between rain events.

Rain Event. Any weather pattern producing precipitation.

Rainy Season. The period of the year during which there is a substantial chance of precipitation. For the purposes of this chapter, the rainy season is defined as starting on October 1 and ending on April 30.

Registered Environmental Health Specialist. A person licensed by the state to practice as an environmental health specialist.

Replanting Area. The area subject to vineyard or orchard replanting.

Reservoir. A water storage structure made by constructing a dam, embankment, or pit with an impermeable liner such as clay or synthetic material.

Ridgetop. A relatively flat topographic divide above divergent and descending slopes where one or more of the descending slopes has an existing slope greater than 50 percent for more than 50 feet in slope length.

Sediment. Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Setback Area. The area within a setback required by Section 36.20.080, 36.20.090, 36.20.100, 36.20.110, or 36.20.120.

Site. All or part(s) of a parcel or adjoining parcels under single ownership or control where new vineyard or orchard development, vineyard or orchard replanting, or agricultural grading or drainage is performed or permitted.

Slope. An inclined surface, the inclination of which is expressed as a ratio of horizontal distance to vertical distance (e.g., 2:1) or as a percentage (e.g., 50 percent). Slope shall be calculated using a method acceptable to the agricultural commissioner.

Soil Amendment and Fertilizing Materials. Organic and in-organic substances applied to the existing soil to improve physical properties of the soil or increase available nutrients in the soil. Soil amendment and fertilizing materials include commercial fertilizers, agricultural minerals such as gypsum and lime, pumice, straw, and manure.

Soil Preparation. Deep ripping, chisel plowing, field cultivating, disking, plowing, harrowing, cultipacking, rototilling, application of soil amendment and fertilizing materials, and other similar activities.

Soils Engineer. A civil engineer experienced in the practice of soils engineering.

Soils Report. A report prepared by a soils engineer or geotechnical engineer that contains not less than the following:

1. The nature and distribution of existing soils.
2. Conclusions and recommendations for grading procedures.
3. Soil design criteria for any structures or embankments required to accomplish the proposed grading.
4. Where necessary, slope stability studies, and recommendations and conclusions regarding site geology.

See also geotechnical report.

Special Flood Hazard Area. Any area designated by the Federal Emergency Management Agency as subject to flooding by the 1 percent annual chance flood (100-year flood).

State CEQA Guidelines. California Code of Regulations, title 14, section 15000 et seq.

Stormwater Runoff. Surface runoff generated by a rain event.

Stream. Any natural or modified channel with bed and banks containing flowing water or showing evidence of having contained flowing water, such as deposit of rock, sand, gravel, or soil. Stream includes creeks and rivers.

Surface Runoff. Any water that flows over the land surface.

Terrace. A relatively level step constructed in the face of a graded slope for drainage and maintenance purposes.

Tree. A woody perennial plant, typically large with a well-defined stem carrying definite crown, with a minimum diameter at breast height of five inches, and a minimum height of 15 feet.

Tree Removal. The removal of more than one-half acre of tree canopy in a new planting area.

Tree Canopy. The more or less continuous cover of branches formed by the crowns of adjacent trees other than orchard trees.

Trellis System. Structures put in place to support and train grapevines in vine rows, including end posts, T-posts, wire, and other trellis materials.

Tribe. A California Native American tribe that is on the contact list maintained by the Native American Heritage Commission.

Vegetation. All natural, non-cultivated plant life, including the root system, stem, trunk, crown, branches, leaves, and blades.

Vegetation Removal. The cutting, breaking, burning, or uprooting of vegetation, the application of herbicide to vegetation, the covering over of vegetation with earth, or the compacting of the soil under and around vegetation. Vegetation removal does not include the removal of invasive plant species.

Vineyard. A planting of grapevines. Land devoted to the cultivation of such a planting.

Vineyard and Orchard Development Permit. See Section 36.04.010.

Vineyard and Orchard Replanting Permit. See Section 36.06.010.

Vineyard Infrastructure. The agricultural road network, equipment turnarounds, drainage system, irrigation system, trellis system, and other basic facilities and systems needed for the operation of a vineyard.

Vineyard Replanting. The replanting of all or part of an existing vineyard where the vineyard is under active cultivation and the footprint of the area to be replanted is not increased.

Watercourse. Any stream, or any artificial channel constructed to facilitate the use of water or convey stormwater runoff.

Wetland. Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. A wetland must have one or more of the following three attributes in the Coastal Zone, and two or more of the following three attributes in all other parts of the unincorporated area of the county:

1. At least periodically, the land supports predominantly hydrophytes (plants specifically adapted to live in wetlands).
2. The substrate is predominantly undrained hydric soil.
3. The substrate is saturated with water or covered by shallow water at some time during the growing season of each year.

Wetlands Report. A report prepared by a professional biologist in compliance with department guidelines to determine and document the location of wetlands on a site, including mapping the wetlands and required setbacks.

Zoning Code. Chapters 26 and 26C of this code.