Property Purchase Assessment

For [redacted] and [redacted]

**Images and identifiable location data have been redacted/obscured to maintain client's privacy

Site Work Up

Client(s): [redacted]
Address: [redacted]
Latitude: [redacted]
Longitude: [redacted]
Altitude: 261’
Proximity to Ocean: 4.17 miles as the crow flies

Precipitation Data

- Rainfall
  - Average: 17.8 - 19”
  - Record High: 54.53” (1965, records starting 1870)
  - Record Low: 7.2” (1897)
- Dew Set Frequency: Unknown
- Fog: Coastal fog banks exert a cooling effect throughout the Edna Valley when present. More frequent during winter and shoulder seasons.
- Snowfall
  - Average Annual: **NA**
  - Record High: **NA**
  - Record Low: **NA**
- Guttation: Often mistaken for dew, guttation is the nocturnal emission of moisture from plant leaves that is often visible in the early morning clinging to leaves. While not technically precipitation, this is an important part of water cycling and demonstrates how plants and trees modify their environments.

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.129** (0.114-0.148)	**0.163** (0.143-0.187)	**0.206** (0.181-0.238)	**0.241** (0.209-0.280)	**0.287** (0.239-0.349)	**0.322** (0.261-0.403)	**0.358** (0.281-0.461)	**0.394** (0.298-0.525)	**0.442** (0.318-0.621)	**0.479** (0.330-0.702)
10-min	**0.185** (0.163-0.213)	**0.233** (0.205-0.268)	**0.295** (0.259-0.340)	**0.345** (0.299-0.402)	**0.412** (0.342-0.501)	**0.462** (0.374-0.577)	**0.513** (0.402-0.660)	**0.564** (0.427-0.753)	**0.633** (0.455-0.890)	**0.686** (0.473-1.01)
15-min	**0.224** (0.198-0.257)	**0.282** (0.248-0.324)	**0.357** (0.313-0.412)	**0.417** (0.362-0.486)	**0.498** (0.414-0.605)	**0.559** (0.452-0.698)	**0.620** (0.486-0.799)	**0.682** (0.517-0.910)	**0.766** (0.550-1.08)	**0.830** (0.571-1.22)
30-min	**0.315** (0.278-0.361)	**0.397** (0.349-0.456)	**0.502** (0.440-0.579)	**0.587** (0.509-0.683)	**0.700** (0.582-0.851)	**0.786** (0.636-0.981)	**0.872** (0.684-1.12)	**0.959** (0.726-1.28)	**1.08** (0.774-1.51)	**1.17** (0.803-1.71)
60-min	**0.451** (0.397-0.517)	**0.568** (0.500-0.652)	**0.719** (0.630-0.828)	**0.840** (0.728-0.978)	**1.00** (0.832-1.22)	**1.12** (0.909-1.40)	**1.25** (0.978-1.61)	**1.37** (1.04-1.83)	**1.54** (1.11-2.16)	**1.67** (1.15-2.45)
2-hr	**0.688** (0.606-0.789)	**0.854** (0.752-0.981)	**1.06** (0.932-1.23)	**1.23** (1.06-1.43)	**1.44** (1.20-1.75)	**1.60** (1.29-1.99)	**1.75** (1.37-2.26)	**1.91** (1.44-2.54)	**2.11** (1.51-2.96)	**2.26** (1.56-3.31)
3-hr	**0.877** (0.773-1.00)	**1.09** (0.956-1.25)	**1.35** (1.18-1.55)	**1.55** (1.34-1.80)	**1.81** (1.50-2.20)	**2.00** (1.62-2.50)	**2.18** (1.71-2.81)	**2.37** (1.79-3.16)	**2.60** (1.87-3.66)	**2.78** (1.91-4.08)
6-hr	**1.23** (1.08-1.41)	**1.53** (1.34-1.76)	**1.89** (1.66-2.18)	**2.17** (1.89-2.53)	**2.53** (2.10-3.08)	**2.79** (2.25-3.48)	**3.03** (2.38-3.91)	**3.28** (2.48-4.37)	**3.59** (2.58-5.04)	**3.82** (2.63-5.60)
12-hr	**1.56** (1.37-1.79)	**1.97** (1.73-2.26)	**2.47** (2.16-2.85)	**2.86** (2.48-3.33)	**3.36** (2.79-4.09)	**3.73** (3.01-4.65)	**4.08** (3.20-5.26)	**4.43** (3.36-5.91)	**4.88** (3.51-6.86)	**5.22** (3.60-7.66)
24-hr	**1.94** (1.77-2.17)	**2.49** (2.26-2.79)	**3.19** (2.89-3.59)	**3.75** (3.37-4.26)	**4.49** (3.88-5.31)	**5.05** (4.26-6.12)	**5.61** (4.60-6.99)	**6.18** (4.90-7.95)	**6.93** (5.24-9.36)	**7.50** (5.45-10.5)

Climate Brittleness

Brittleness gauges climate vulnerability to desertification. The brittleness scale is subjective and has no formula for calculation, but can be thought of as a continuum, ranging from a very humid 1 (tropical rainforest) to a very arid 10 (desert). We use brittleness to inform management decisions for a given property or bioregion.

Where any given climate falls on the brittleness scale is determined not so much by total rainfall, but rather by the distribution of precipitation and humidity throughout the year. This pattern determines the degree of brittleness. Very brittle environments typically have a long period of non-growth and can be very arid. Brittle environments also tend to accumulate more dead plant material as biological breakdown of carbon-based plant tissues by insects, microbes and fungi all but cease during the long dry season. This can have a negative effect on the health and resilience of the vegetation due to increased risk of catastrophic fire (due to built up fuel levels) and decreased light penetration to young growing tips (blocked by dead, standing vegetation).

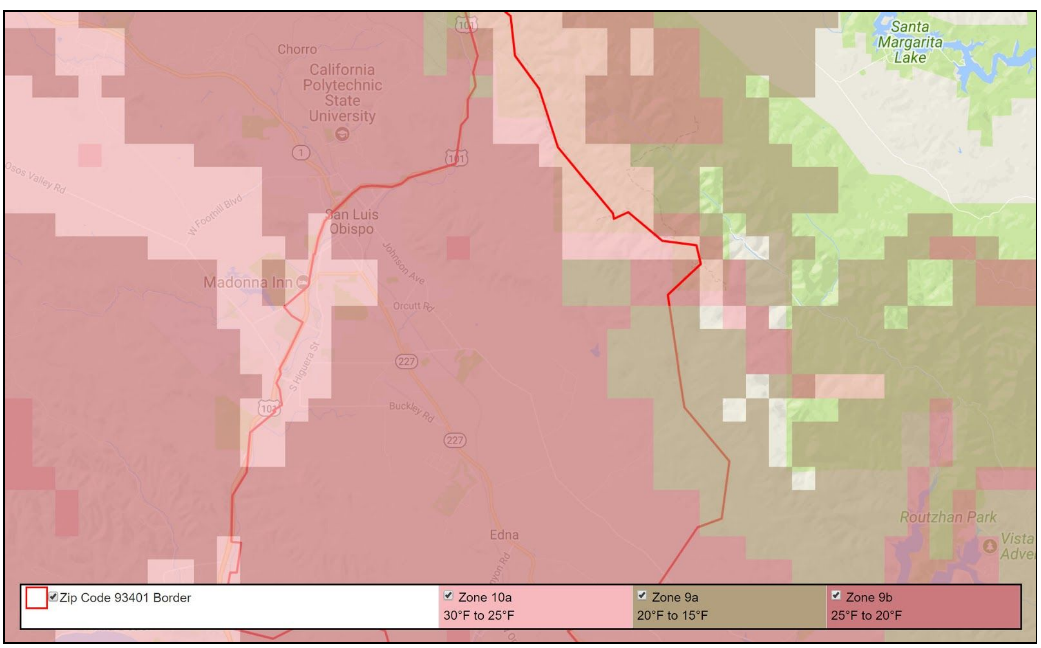
- The climate at [redacted] tends towards being quite brittle. Long summer dry seasons and fairly short winter wet seasons predominate. There is a significant maritime influence on the property, which brings with it exposure to a fog cycle.
- **Longest Period Without Precipitation:** up to and occasionally exceeding 8 - 9 months
- **Annual Distribution of Precipitation:** Typically 80% of total annual rainfall falls between December and March, making this a fairly brittle climate.

Temperature Data

- Seasonal Ranges
  - Coldest Month: Dec - Feb
  - Hottest Month: July - Sept
  - Past 5 years
    - Record High: 102
    - Record Low: 27
- Growing Season (est.): Late February - Early June
- Average Frost Depth: NA

USDA Hardiness Zone

- **What is a USDA Hardiness Zone?** Your USDA Hardiness Zone gives an approximation of the lowest temperatures your site will experience in a given year. It is a helpful, if somewhat limited tool in determining what will survive (not necessarily *thrive*) in your area.
- **How can I find out my Hardiness Zone?**
  - Visit a site like PlantMaps.com and enter your zip code for a color coded view of zonation in your area.
  - OR visit http://planthardiness.ars.usda.gov/PHZMWeb/ and enter your zip code.
- **Hardiness Zone for 93401 -** 9a (20 - 25F), 9b (25 - 30F), 10a (30 - 35F)
  - Direct observation of the actual property indicates 9a as the most appropriate range. Microclimates and site specific characteristics will vary.



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Sunset Climate Zone(s)

- **What is a Sunset Climate Zone?** Sunset climate zones take into account length of growing season, timing and amount of rainfall, winter lows, summer highs, wind and humidity. They provide a more detailed climate description than the USDA model, helpful in selecting which plants will not only survive but thrive with local climate variability. List of maps and climate zones descriptions.
- **Sunset Climate Zone for [redacted]**
  - **Sunset Climate Zone for [redacted]: 15 and/or 16**
    - **Zone 15:** Zones 15 and 16 are areas of Central and Northern California that are influenced by marine air approximately 85 percent of the time and by inland air 15 percent of the time. Also worthy of note is that although Zone 16 is within the Northern California coastal climate area, its winters are milder because the areas in this zone are in thermal belts (explained on page 28). The cold-winter areas that make up Zone 15 lie in cold-air basins, on hilltops above the thermal belts, or far enough north that plant performance dictates a Zone 15 designation. Many plants that are recommended for Zone 15 are not suggested for Zone 14 mainly because they must have a moister atmosphere, cooler summers, milder winters, or all three conditions present at the same time. On the other hand, Zone 15 still receives enough winter chilling to favor some of the cold winter specialties, such as English bluebells, which are not recommended for Zones 16 and 17. Most of this zone gets a nagging afternoon wind in summer. Trees and dense shrubs planted on the windward side of a garden can disperse it, and a neighborhood full of trees can successfully keep it above the rooftops. Lows over a 20-year period ranged from 28 to 21°F (–2 to –6°C), and record lows from 26 to 16°F (–3 to –9°C).
    - **Zone 16:** This benign climate exists in patches and strips along the Coast Ranges from western Santa Barbara County north to northern Marin County. It's one of Northern California's finest horticultural climates. It consists of thermal belts (slopes from which cold air drains) in the coastal climate area, which is dominated by ocean weather about 85 percent of the time and by inland weather about 15 percent. Typical lows in Zone 16 over a 20-year period ranged from 32 to 19°F (0 to –7°C). The lowest recorded temperatures range from 25 to 18°F (–4 to –8°C). This zone gets more heat in summer than Zone 17, which is dominated by maritime air, and has warmer winters than Zone 15. That's a happy combination for gardening. A summer afternoon wind is an integral part of this climate. Plant trees and shrubs on the windward side of your garden to help disperse it.
  -

Koppen Geiger Climate Classification

- **What is the Koppen Geiger Climate Classification System?** A widely used climate classification system, useful in tracking large scale climate changes over time. Helpful visualizations are available as .kmz files in Google Earth. Knowing your KGCC rating can be especially helpful in quickly finding climate analogues around the world as a starting place for researching biological systems, management practices and species that will have a high likelihood of success at your location.
- **How do I find out what my KGC Classification is?** Visit http://koeppen-geiger.vu-wien.ac.at/ to view the US map, available by county.
- **San Luis Obispo County** is listed as **Csb -** The **C** stands for warm temperate, the lower case **s** for precipitation mode of 'summer dry' and the lower case **b** for a temperature rating of 'warm summer'. This is generally considered a Mediterranean climate.
- Here's the Wikipedia page with a short list of other *Csb* climates around the world.

Chilling Hours

- **What are Chilling Hours?** Deciduous trees need to accumulate a minimum number of hours below 45°F during their dormancy in order to set fruit the following year. Knowing the approximate amount of chilling hours your property experiences throughout the cold season will help inform future productive plant choices (i.e. which fruit trees are likely to do well in your area). Chilling hours can vary significant even across the same piece of land; low spots, frost pockets, slopes and wind tunnels or wind buffered areas will all experience different chill hours. Get to know your land!
  - **Below 45 Model:** Chilling hours are the total number of accumulated hours below 45°F accumulated while the tree is dormant.
    - **For warmer climates any hours above 60°F during the dormant season will be subtracted from the total.
- **How do I calculate my Chilling Hours?**
  - Use a chill calculator like GetChill.net and use the Wunderground Station Locator to find the station nearest you.
  - Station Nearest: [redacted]
    - Your Nearest Station ID: [redacted]
  - Chilling Hours for Past 5 Years

Chilling Begin Date	Chilling End Date	Chill Hours
11/01/15	2/28/16	0
11/01/14	2/28/15	0
11/01/13	2/28/14	0
11/01/12	2/28/13	0
11/01/11	2/28/12	0

Wind Data

- **Prevailing winds:** The prevailing wind blows from North x Northwest to South x Southeast (down the Edna Valley) and is more noticeable across the low lying portions of the property. Cool down canyon (West to East) breeze present within the property's primary watershed boundaries. Some onshore air movement (opposite prevailing), often cooler winds coming off fog banks. Average wind speed of 5 mph.
- **Summer winds:** Santa Ana winds during the fall. Max gust ever recorded 132 mph.
- **Winter winds:**
- **Potential fire zones:** Fire risk is 360 degrees. Downhill neighbors and lots of dry grass could mean rapid movement of fire uphill towards main residence.
- Live U.S. Wind Map

Solar Aspect

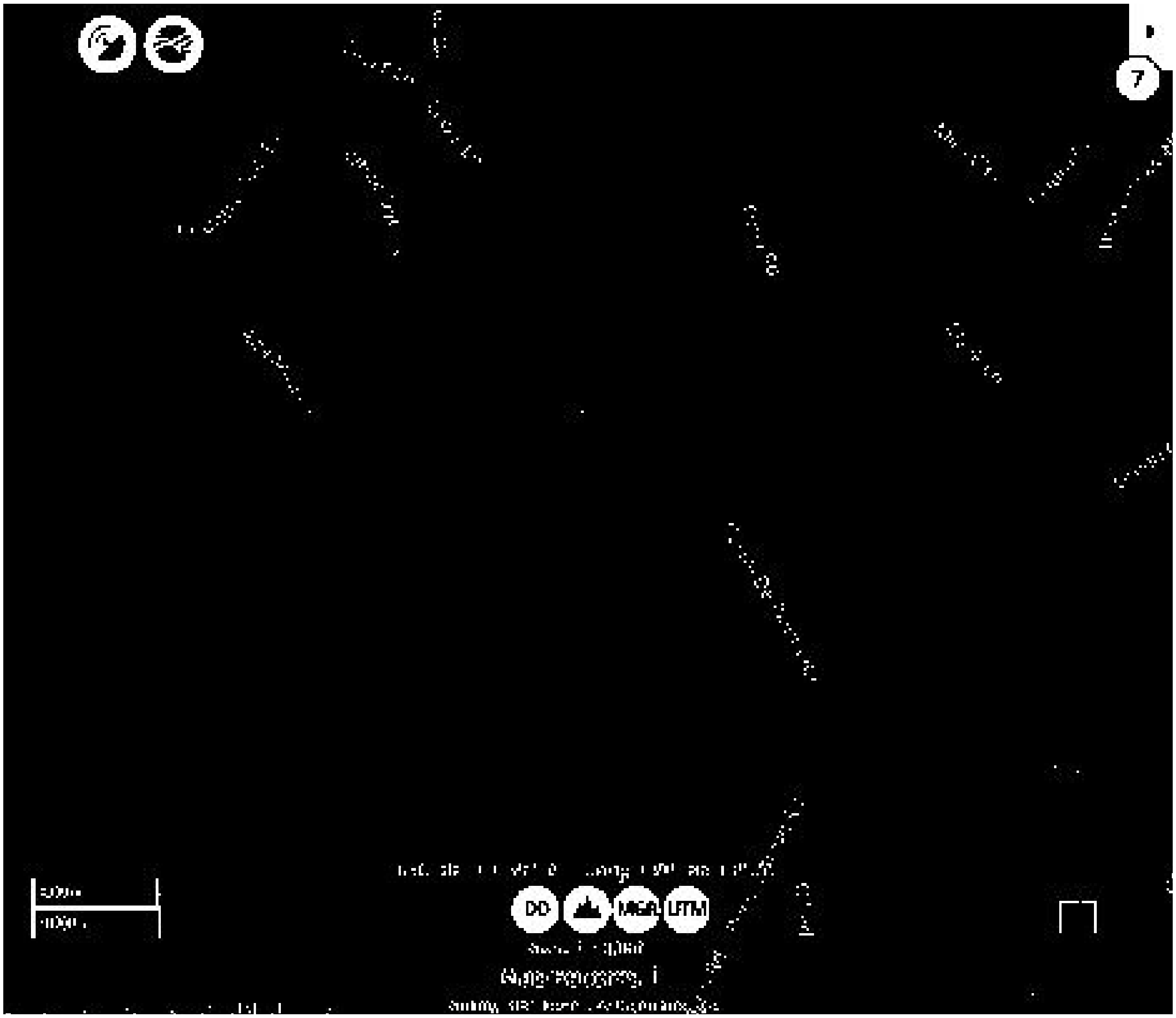
Season Change	Sun Angle*	Shadow Length	Sunrise Location**	Sunset Location**
Winter Solstice	31.36°	1.64	118.46°	241.54°
Spring Equinox	54.87°	.7	88.97°	271.28°
Summer Solstice	78.23°	.21	60.19°	299.81°
Fall Equinox	55.28°	.7	88.7°	271.06°

* Sun Angles measured when highest in sky (peak solar activity)
** Exact locations of sunrise/sunset on the horizon, use SET's Sunrise-Sunset Calendar, visit mooncalc.org to get similar data for lunar cycles.
*** Shadow length expressed as multiple of object height, taken at peak solar activity
**** detailed solar aspect charts and info available through suncalc.org, sunearthtools.com

Solar Chart [redacted]

Approximately 280 days of sun per year in Pismo Beach, nearer to 300 at the actual location of the property.

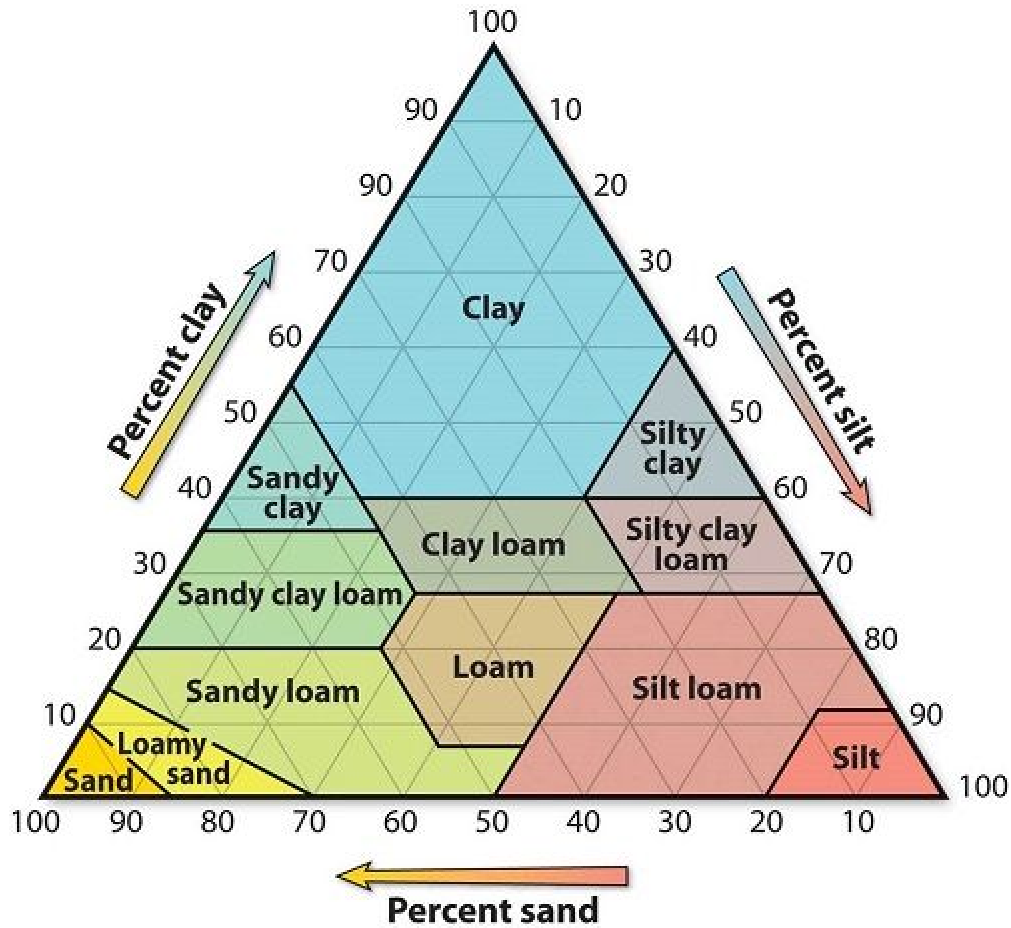
Topography



- Slope(s): Predominant slopes facing East to due South, overall property slope runs Northeast.

Soil Data

- Test Site Location(s): Perform Jar Test if applicable, label location, depth of sample.
  - Percent Sand:
  - Percent Silt:
  - Percent Clay
  - Depth of Soil Sample:
  - Soil Texture Classification Triangle

- 

- **NRCS Web Soil Survey Data**
  - **[AOI Image]**
  - Area (acres):
  - Percent(s) of Area of Interest:
  - Description
    - Setting
    - Typical Profile/Soil Horizons
    - Properties/Qualities
      - Infiltration Rate: 4 gal / square foot / hour
    - Interpretive Groups
      - Land Capability Classification
        - Irrigated:
        - Non-irrigated:
      - Hydrologic Soil Group:
      - Ecological Site:
      - Hydric Soil Rating:

Soil Tests - Should you decide to pursue further soil testing before purchasing/selling your property, these are a few places to begin.

- For habitat and vegetation testing
    - Micro-organism levels
    - Inorganic level (nutrients such as nitrogen potassium, and phosphorous)
    - Soil p.H.
    - Potential presence of:
        - Heavy metals
        - Toxins
        - Chemicals
- For earthworking / geotechnical testing
    - Field Capacity:
    - Proctor Compaction Testing:
    - Direct Shear Test:
    - Dispersive Testing:
    - Atterberg Limits Test:
- Soil Testing Services - UC Davis Analytical Laboratory

Local Knowledge

- Ask neighbors if they spray chemicals and look for where they enter the property
- Historical patterns of precipitation, flooding, puddling etc.

Aquifer Information

- Principal Aquifer Map of U.S.
- California Groundwater Basin Boundary Assessment Tool
- California Water Management Planning Tool

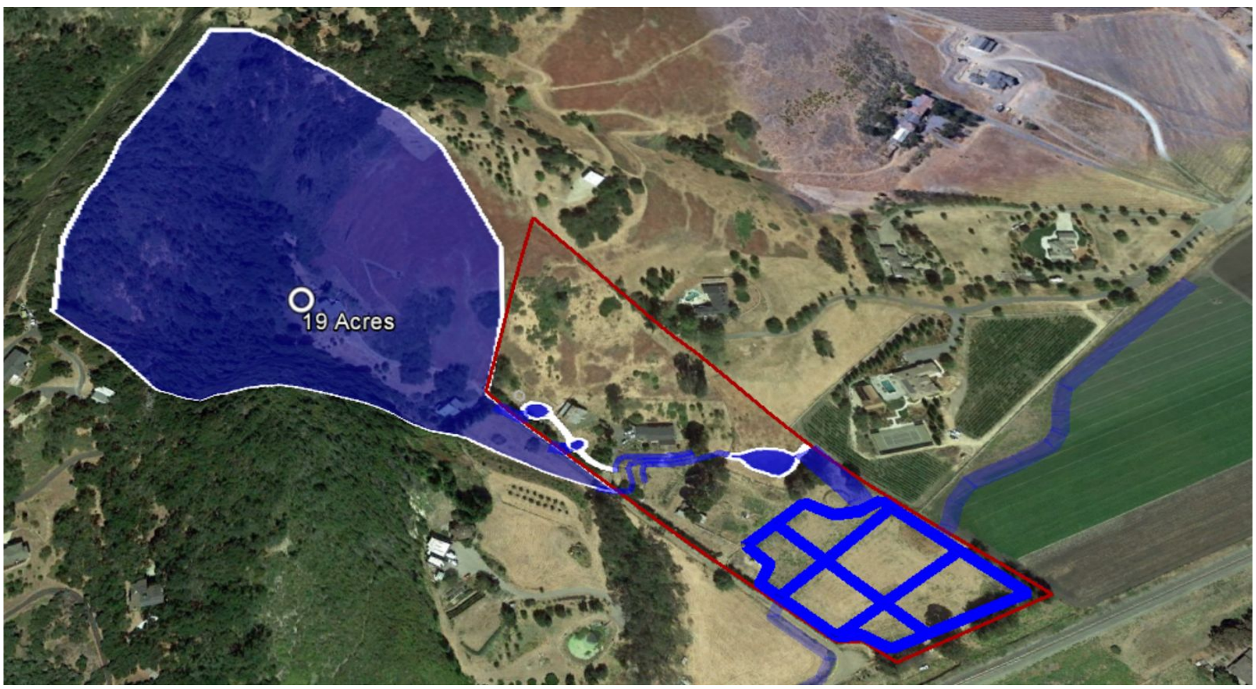
Soil History

- **How did it get there?** Deposition over time from upper Edna Valley.
- Indigenous peoples history? **Northern Chumash Band**
    - Ancestral rights to examine dig sites for archaeological remains? **YES.**

Water

Context: Clients are looking to establish passive hydration systems in their landscape the will enable capturing and infiltrating as much rainfall as possible. Proposed systems include major infiltration capillaries in the lower parts of the property to deal with run-on from neighboring ag land, as well as expanding and remodeling an old pond, installing spillways and inflows and a rolling dip along the main access road to hook up the 19 acres uphill catchment with their infiltration systems.

Watershed Map



Run On Potential

- **Catchment Area (ft^2) x Rainfall (ft) X (7.48 gal/ft^3) = Total Rainwater (gal)**
- Adjust using approximate values below for Run-off Coefficients

19 acres = 836,750 ft2
18 inches (average annual rainfall) = 1.5 ft
836,750 * 1.5 * 7.48 gal/ft3 = 9,338,335 (gal)

9.3 million gallons of rainfall on the valley above the property in an average year. If we multiply that number by an estimated runoff coefficient of 25% (0.25), that means that **2,347,083 gallons (or 7.2 acre feet)** of water flows down the road in an average year.

The Four R's of Regenerative Hydrology

The actions of regenerative hydrology can be expressed in terms of sound fiscal budget management. The 4 R's of a water budget are equivalent to income, deposit, savings, and expense. We want the water balance of our watersheds to run in the blue and not in the red. We want to ensure that our liquid assets continually produce a high-quality return on investment, and we want to re-invest our returns back into our watersheds to continue building principal.

Receive = Income

- Watersheds only receive water as snowfall, rainfall and fog precipitation. Annual precipitation is the only true source of ***income*** to re-supply a property's water budget allowance. Everything else (drafting fossil aquifers, importing from other areas) is drawing down on principal.
- Regenerative hydrology advocates the adaptive management of watershed lands to optimize rehydration by promoting land use patterns that enhance the receptive capacity of a watershed in times of excess and the retentive capacity in times of drought.

- **Landscape Water Income Statement**
    - One inch of rain falling on a 1000 square foot area is equivalent to 623 gallons of water.
    - On a per acre scale (43,560 sq ft) that means 1 inch of rain is equivalent to 27,138 gallons of water.

Recharge = Deposit

- Recharge processes are critical for the landscape to annually refresh itself via the deposit slip called infiltration. The capacity to make water deposits depends on the watershed's recharge potential. Precipitation received by the watershed must percolate and be absorbed, or else there is no replenishment of the water savings account.
- Recharge potential and functions are impaired by the hardening and paving over of natural recharge areas, the disconnection of rivers from their floodplains, the deforestation of native vegetation, and the draining of wetlands.

- To increase recharge we can:
  - Limit impervious surfaces and the wholesale conversion of native vegetation.
  - Implement stormwater pacification techniques designed to slow, spread, and sink water into earthen storage.
  - Protect open space in known groundwater recharge areas. If site conditions are not conducive to recharge, then we must ensure proper bio-filtration of all surface waters prior to their discharge and deposit into rivers, wetlands, lakes, estuaries, and oceans.

- **Landscape Recharge Capacity**
  - **Current Condition:** Water poor, few opportunities for infiltration, brittle, dry.
  - **What Can Be Done To Increase Capacity:** Whole-systems earthworks - rolling dip on roadway feeding into cross property drain at 1.5% grade into remodeled pond, which will have a spillway in case of major events into the Lower Agroforestry Zone where major earthworks will be installed to slow, spread and sink as much of the run-on from the up-canyon properties as possible before passively discharging excess water via a level sill through the existing culvert system.

Retention = Savings

- The retention of recharged precipitation is like a savings account asset that yields interest. The storage of water is often the most challenging aspect of water supply management. Regenerative hydrology strategies should appropriately slow water down, increasing the residence time of water storage in our watersheds. This will optimize the amount of water available for local expense by living processes.
- We must avoid overdrafting of our watersheds. Water should never be extracted out of storage in amounts greater than what is annually received and recharged. While this can go on for a while, eventually a penalty must be paid. In situations where this is currently occurring, we can take steps to mend the broken hydrological cycle to ensure that as much water as possible is being returned to the landscape before it leaves.

- **Landscape Water Savings Statement**
  - **Current Condition:** High and dry, lots of water passes through but little stays.
  - **Where We Can Go From Here:** By reforesting and re-grassing the infiltration zone in the Lower Agroforestry Area we can establish long term infiltration capacity and reduce evaporative loss by shading the soil.

Release = Expenditure

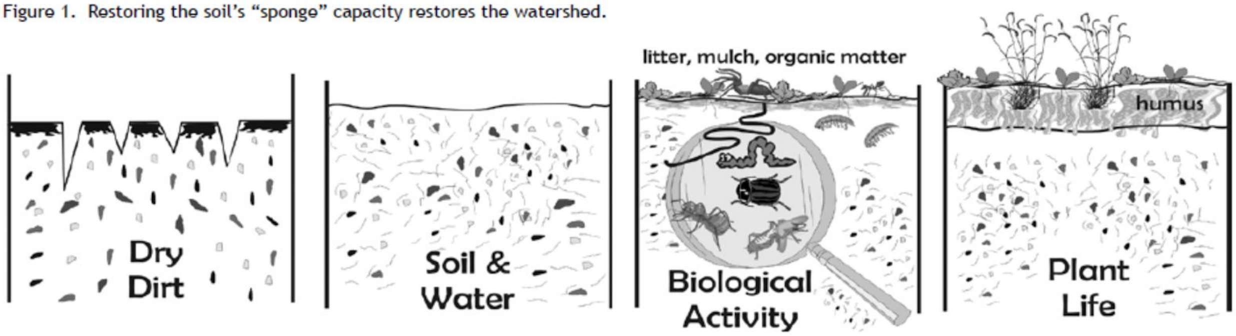
- Ideally expenditure of water assets will go to further increase the reception, recharge and retention capacities (the first 3 R's) of the watershed.
- Planet Water utilizes many ways to release its signature element naturally to the ocean, land and atmosphere in a process known as the water cycle. Through seasonal snow and ice melts, groundwater springs and seeps, water is returned to creeks and rivers. Solar evaporation and the evapo-transpiration of plants help to form new clouds and feed the cycle anew. The infinite nature of this cycle is to continually flow and be in flux as the expense of one stage produces income for the next.
- Common modern anthropocentric development practices (creating impervious surfaces, channelizing stormwater, etc.) tend to increase the rate and volume of storm water's return to the ocean via excessive runoff and heightened flood discharges. This directly reduces the landscape's ability to retain water and diminishes the amount of water available for later release during the dry season when it is most needed.

- **Landscape Expense Statement**
  - **Current Condition:** Old water tanks on hill, currently not utilized. Pond empty for most of the year, has no input source other than direct rainfall and run-in from small upslope area.
  - **Where We Can Go From Here:** Linking the various systems together - well to tanks, tanks to house and fields, road to pond, pond to LAZ, and LAZ to run-on sources from neighboring properties - will enable this land to become a net positive to the local aquifer, as well as enable production through greater parts of the dry season by drought proofing the landscape and restoring hydrological function.

Water Patterning Strategies for Regenerative Hydrology

Slow, Spread, Sink, Grow

Figure 1. Restoring the soil's "sponge" capacity restores the watershed.



1. **Slow The Water Down -** By slowing the movement of water over a landscape we reduce it's erosive potential and allow for infiltration to occur. Common methods for

achieving this are increasing vegetative cover (grasses, trees, plants), installing earthworks (swales, catchment basins, scallops, net and pan etc.) and limiting/reducing the use of hardscape and consequent concentrated run-off flows, and when possible using permeable surfaces.

2. **Spread The Water Out -** Part of slowing water down is to spread it over as much surface area as possible, and reduce any peaks in concentration. The more surface area the water can touch the greater the opportunity for it to sink in and be put to work in the landscape. Common methods for spreading water include those mentioned above as well as geological and biological flow spreaders (plants and/or rocks arranged to pacify and spread overland flows).
3. **Sink The Water Into Soil -** If we've done steps 1 and 2 well, this part will take care of itself. For this we emphasize permeable surfaces where hardscape is necessary and encouraging vegetation where it is not (plant and tree roots are the best infiltration mechanisms we have).
4. **Grow Biomass -** By slowing water down, spreading it out, and encouraging infiltration into living soil we create the greatest amount of living edge possible for water to interact with. It is here that the landscape and its stewards reap the greatest rewards, as evaporation is reduced, solar energy conversion to biomass is maximized and life expression is steered towards abundance.

Wells - Construction, Operation, Maintenance

- California Groundwater Information Center - Well Basics

Access

Access Planning Principles

- **To maintain access, manage water.** Site topography and its resultant influence on the movement of water through and within the site is the primary influencer of access route placement. How water interacts with any access route, be it a hard top road or a deer trail, will determine the route's long term stability and required level of maintenance.
- **Make water your friend.** Harmonize with the patterns of water already present in the landscape when planning, installing or remodeling access routes. This will always lead to better performance and lower maintenance costs. Good access at minimum maintains watershed function, and ideally improves it.
- **A stitch in time saves nine.** Maintain access routes regularly.
- **A road serves at the pleasure of its topography.** Forcing access where topography is not amenable to it dramatically increases expenses in the near and long term.
- **Drain water from access routes as often as possible.** Always at first chance and last chance locations.

Roads Leading To Property?

- Gravel **-** mix of various sizes of road base aggregate.

Roads On The Property?

- Some Paved, somd gravel.

Current Access Drainage Patterns

- Where is the water coming from?
- Where is the water going?
- Where SHOULD the water be going?
- RUNOFF: water that has not been evaporated/absorbed, has erosive capability, can be an asset or a liability.
    - 1" rain = 27,000 gallons/acre ~ 25,000 gallons after evaporative loss
        - On paved road, 80-90% of this is runoff

Topography - Terrain features such as…

- ELEVATION: Higher up = more run off
- RELIEF: difference in elevation between current position and top of ridge of bottom of valley
    - More relief = more opportunities for drainage
- ASPECT: angle of road surface face relative to the sun
    - Northerly aspects are wetter, icier, dry slower (Northern Hemisphere)
    - Southerly aspects dry faster, thaw & freeze, have thinner soils and are typically closer to bedrock (Northern Hemisphere)

- STEEPNESS: Grade, measured in % or degrees
    - 2x steepness = 4x erosive power of same volume of water
- LENGTH OF SLOPE: longer slopes = more accumulated water
    - Moderate: <40% grade
    - Steep slopes >40% grade require entire road to be on a bench cut, cannot cut and fill
    - Toeslope is the generally the best place to put a road
    - Valley Bottoms are terrible road locations

Soils

- TEXTURE refers to size, composition and proportion of different sized particles (a key factor in determining location, construction and drainage methods)
- SIZE: from smallest to largest
    - Clay > silt > sand > gravel > cobble > larger
    - Coarser texture gives you more options
    - Valley bottoms tend to be composed of similar sized particles, whereas hillslopes have better mixes of sizes for creating more stable surfaces

Reading the Roadway

- GRADE: steepness expressed as percentage +/- in direction of travel
- WIDTH: width of the traveled/maintained surface
- CROSS SECTION: measured at right angles to direction of travel, includes cut slope, fill slope, ditches etc. (i.e. all disturbed ground resulting from road installation)
    - The narrower the road the better! Make it no wider than what is needed to minimize amount of runoff that needs to be dealt with
- SLOPE:
    - 2x slope = 8x particle size that can be transported by same volume of water
    - 2x slope = 4x erosive power of the water (amount of bed load that can be carried)
        - Same goes the other way: ½ the slope = ¼ the sediment moved
            - This means changing from steeper grades to shallower grades will create deposition zones! This can clog drainage features without proper planning!
        - Steeper roads require more frequent drainage!
    - 2x Length of Slope = 4x as much sediment moving power and 8x sediment size that can be moved by same rain event on slope of half the length

Good Road Design and Maintenance

- Drainage features need to be closer together when on finer grained soil and/or steeper grades
- Vegetative cover is critical for drainage areas
- ALWAYS drain water at your FIRST *AND* LAST chance
- Plan for drainage water as a productive resource - put it to work in the landscape!

Road & Access Management Strategies

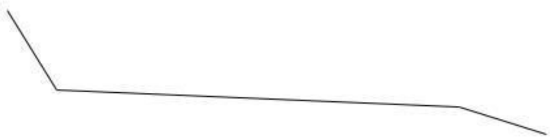
- Manage low standard roads for maximum drainage, not speed.
- Prioritize treatments that accomplish both road maintenance and water harvesting.
- Set aside a portion of annual maintenance budget to improve problem road or segments incrementally.
  - Include systematic approach to ditch maintenance in annual maintenance program.
- If a road segment cannot be drained effectively, replace, relocate or rebuild it.
- If it ain't broke, don't fix it.
- Fix the easiest things first!
- AVOID the <u>double fetch</u> - removing water from one road surface and depositing onto another (major issue with switchbacks).
- When rounding points if coarse material is present outslope the road.
- Keep runoff water in originating watershed - it is already sized to accommodate this flow!
- Remove berms wherever feasible (i.e. never impede drainage when you don't have to).
- Never drain into a spring site (sedimentation can choke spring, harm downstream ecology).

Road Types

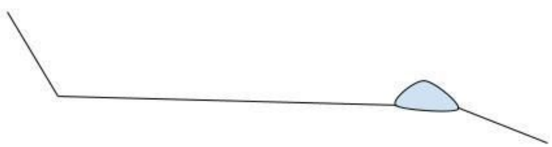
Crowned: 2-4% grade over the crown (less and drainage will be impeded and vehicles will cause ruts, more and vehicles will drive down the middle and cause ruts)

Crowned with Vegetated Drain Ditch (BMP): 2-4% grade over the crown (less and drainage will be impeded and vehicles will cause ruts, more and vehicles will drive down the middle and cause ruts). Vegetation slows run off and reduces scouring, erosion of road side ditch.

Insloped: 2-4% grade sloping in towards the cut side of the road.



Outsloped: 2-4% grade sloping in towards the fill side of the road. Requires coarser textured material to maintain form with use.

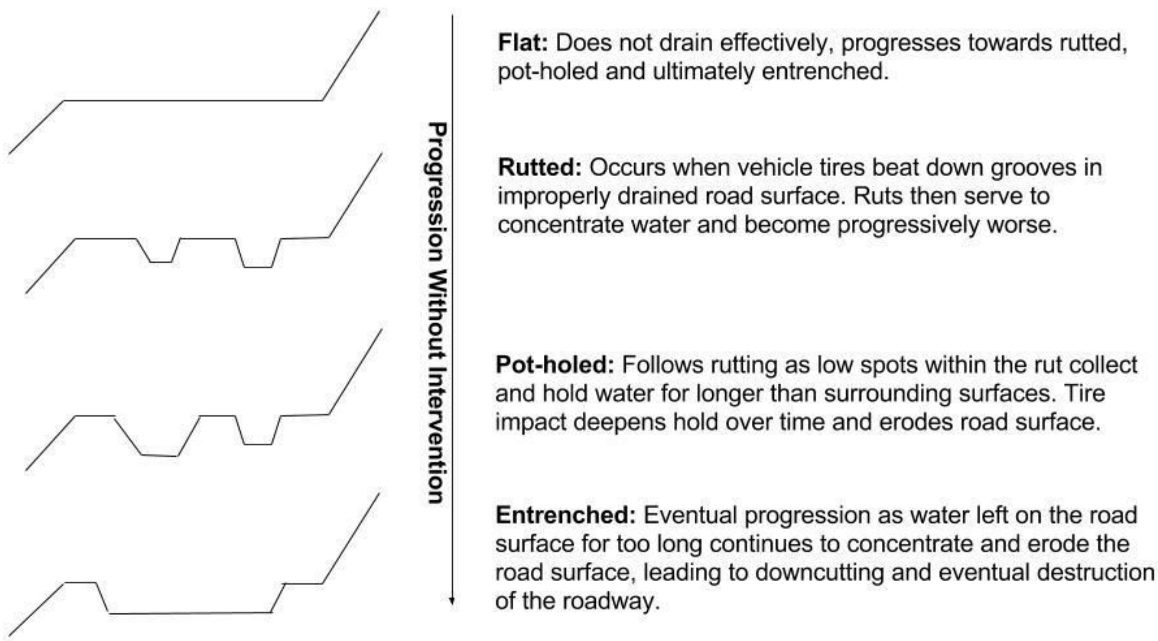


Bermed: ONLY used when bypassing an area where drainage off road not desirable - i.e. springs, seeps etc. Needs to have frequent breaks otherwise to allow drainage. Berms can occur from sloppy grading.

Elevated: Good for crossing valley bottoms and/or wetlands.

Problem Road Templates

The figure below illustrates the stages of breakdown and the order in which they occur when dealing with poorly drained road surfaces.



Intervention is required in order to reverse this progression which ultimately concludes with the loss of the road and its function in the larger system. The longer appropriate intervention is delayed, the worse the problem will become and the more costly the solution that will be required to ultimately fix it.

Structures

Context: Each building site will have its own innate qualities stemming from its slope, solar aspect, wind exposure and topography among other factors. The goals for this section are multifold; 1) to identify the most suitable building sites, 2) to generate a list of suitable building types given the innate qualities of the site and the functions that the building needs to perform, and 3) the orientation of the building at the site to the natural energies, opportunities and threats present (sun, wind, water, fire, view, sound, security etc.). Additionally we will examine existing structures and make recommendations for potential retrofits to help increase functionality, decrease cost of maintenance, and harmonize with natural energies present.

Restrictions - Building Codes / Permits / Legal Barriers

- Building code restrictions
- Building permits - SLO County Planning & Building
- Septic codes - **septic systems/hookups required.**
- Zoning ordinances
    - Industrial, Ag, Commercial/Retail, Housing/Suburban
    - **Property is zoned for agriculture.**
- Utility easements
    - Utility types
        - Gas - **Property has high pressure gas pipeline and associated easement running through the LAZ from Southeast to Northwest.**
        - Electricity - **Power lines follow road to house and neighboring properties.**
        - Cable
        - Phone / Cell Towers
        - Sewer
        - Pipelines
        - Oil wells - **nearby properties in neighboring canyons have functioning oil and gas wells, though none are immediately adjacent to the property.**
        - Other
- HOA's - **NA**
- Permits needed for proposed construction / retrofits? - **NA**

Proposed Structure Siting and Orientation

- What type of structure is proposed?
- What functions does it need to fulfill?

Zone and Sector Analysis

- Solar Aspect & Access
  - Sun's relationship to structure siting, orientation, construction, materials
- Physical Access
  - Roads, paths, other.
- Thermal Efficiency
  - to the sun in temperate, to the winds in tropics
- Acoustic Privacy / Sensitivity
  - Sounds to block out
  - Sounds to invite in
- Visual Privacy / Exposure
  - Lines of sight to block out
  - Lines of sight keep open / expand
- Water
  - How do we keep the foundation healthy?
  - How do we use the water from roofscape(s)?
  - How will the structure obtain and use water?
    - Where will used water go? How will it be used?
- Wind
  - ID predominant winds, seasonal storm winds
  - Need for wind protection? (windbreaks, windramps etc.)
- Fire
  - ID primary risk corridors
  - Clearing necessary? Sprinklers?
- Security
  - Vegetative elements
  - Visual elements

Proposed Zonations

Zone 0: Existing Main House, Potential Yurt Site, Barn/Office

Zone 1: Kitchen Gardens, Patios and Walkways, Wood pile for heating, Regularly visited fruit trees
Zone 2: Community Dining, Fruit Orchard, Pond, Animal Pens, Kitchen Compost
Zone 3: Market Gardens, Silvopasture, Large Compost
Zone 4: Wild Foods, Forage, Timber, Hiking, Water Tanks
Zone 5: Restored Forest